PROJECTIONIST

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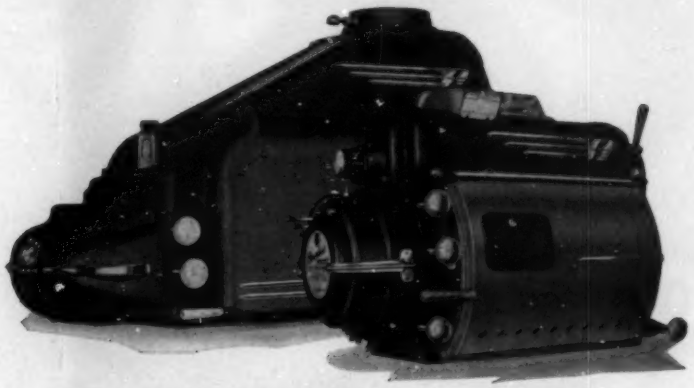

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MONTHLY CHAT

ELSEWHERE in this issue there appear excerpts from the address given at the recent IA convention in Cincinnati by Merle Chamberlin, director of projection for the M-G-M studios in Culver City, Calif. This address was of two-fold significance:

1. It marked for probably the first time the appearance at a public forum of a top-flight production executive who openly proclaimed the industry's utter dependence upon the technological processes, and (2), it served as an adrenalin-shot to the morale of the projectionist craft which for years has endured the stigma of a "dispensable" and "tolerated" adjunct of the industry.

No more is this business of ours a mere welter of buying and selling a product which depended for its very lifeblood upon the technological processes — although the "brass" knew it not. This has been demonstrated in fulsome measure over the years by such industrial titans as, for example, Eastman Kodak, General Motors, and DuPont.

We once heard David Sarnoff, who traveled the torturous course of technology to his present eminence as head man of RCA, say that the word "research" was invariably mispronounced; he insisted that the accent should be placed upon the second syllable.

Change in Mental Atmosphere

This constant seeking for that which is not only new and novel but that which is *better*, determines the lifespan for industry no less than for humans. This point of view which has for these many years earned for IP the appelation of "carping critic", is now granted industry-wide acceptance. For its part, IP welcomes this change in the mental atmosphere; but it induces no blushing on our part to say that we alone of the entire industry press kept our sights on distant horizons.

To Cinerama, to CinemaScope, to VistaVision, and to all those hardy souls who supplemented their brains, their hands, and their hearts with the mighty resolve to go forward, IP makes obeisance.

It is our purpose—and the only reason for our existence—to pursue these distant goals so that we and every other segment of this industry shall go forward.

The foregoing is by no means the product of random thinking but rather a coldly-calculated approach to a problem fraught with the utmost significance to the industry at large. At the risk of being charged with mouthing the same old refrain, IP still holds to the view that endless benefits would stem from a single afternoon session in some secluded nook attended by, say, five persons from the technical end of this business. The object: standardization.

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Vol. 29 No. 9

Sept. 1954

We Invite Your Attention to . . .

the pages immediately following: three articles by internationally-recognized authorities on the art of visual and sound reproduction. Whatever their divergencies in points of view, these data provide, at the very least, a sound basis for serious discussion.

Screen Light With Various Projection Aspect Ratios

By CHARLES A. HAHN
J. E. McAuley Mfg. Co.

THE APPENDED data compares the aperture opening areas of the various aspect ratio apertures (Table A). The listed comparison of percentages may be taken as a rough indication of their light-passage rating from a given light source. Just as it is the size or area of a window that determines how much daylight can enter to illuminate a room, so it is that the size of the aperture opening determines how much light will pass to and through the projection lens and thence to the screen.

The writer has elected herein the standard 0.600 by 0.825-inch sound aperture as representative of 100% in light-passage rating.

By way of further explanation: suppose that a theatre has been regularly operating with a standard sound 1.37:1 aspect ratio aperture, with a 3-inch, F:1.8 projection lens, and has been obtaining therewith 19,000 total screen lumens, and a picture size of 15 by 20.5 feet, which would be 307.5 square feet in area.

Height-to-Width Ratio Vital

It is then decided to use a 1.85:1 (No. 4) aspect ratio aperture with the same size screen and the same projection lens. The picture size will then be the same width, namely 20.5 feet—but only 11 feet high (Fig. 1).

Now, because the light-passing rate of the 1.85:1 (No. 4) aspect ratio is 74% of the 1.37:1 (No. 1) ratio picture, the total screen lumens will be reduced from 19,000 to approximately 14,000—but each square foot of the 1.85:1 (No. 4) picture will, in foot-candles, be as bright as the 1.37:1 (No. 1) picture.

This result ensues because the 1.85:1 (No. 4) aperture is only smaller in height, hence blocks out a part of the light that would pass through the larger 1.37:1 (No. 1) aperture.

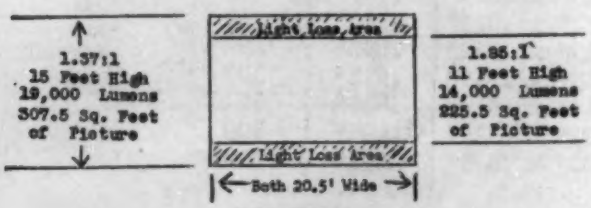


FIGURE 1

Presuming that it is decided that the resultant picture (3-inch lens) of 11 feet high, at the same 20.5-feet width, is lacking in height and should be enlarged to the 15-foot height of the former 1.37:1 (No. 1) aperture picture. After this has been done, the width of a 15-foot high, 1.85:1 (No. 4) aspect ratio picture becomes 27.75 feet wide, and the total area of the picture becomes 416.2 square feet instead of 225.5 square feet—an increase in picture area of 85% (Fig. 2).

Since it is now necessary to illuminate the increased picture area with only 14,000 total screen lumens, let's hypothetically assume that the required shorter 2¼-inch focus projection lens will pass the same amount of light that the former 3-inch focus lens did, in which case the foot-candle illumination of the picture field will drop from 62 foot-candles formerly possible on the 15 by 20.5-foot picture field to 34 foot-candles, or approximately 54% on the larger 15 by 27.75-foot picture.

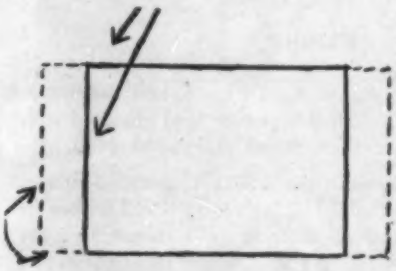


FIGURE 2
Top arrows: 1.37:1 picture of 15 x 20.5 feet; total area 307.5 square feet, 62 foot-candles, or 100%.
Bottom arrows: 1.85:1 picture of 15 x 27.75 feet; total area 416.2 square feet, 22 foot-candles, or 36%—which is 64% less than that obtained with the 1.37:1 ratio. (NOTE: all figures in "total light," with no allowance for shutter or other losses.)

Basic Essentials Still Prevail

However, our hypothetical assumption now must be made *factual* because the shorter 2¼-inch focus projection lens does not pass the same volume of light (foot-candles) as did the longer 3-inch focus lens, even though they both bear the same F:1.8 light-speed marking.

In consequence, to get a true picture of the final results, we must make another deduction of 34% from the already reduced average foot-candle figure of 54%. So in the end we find that, after making all of the projec-

tion changes necessary, to use an 1.85:1 (No. 4) aspect ratio aperture and enlarging its picture to 27.75 feet wide, we end up with an average screen illumination of 22 foot-candles.

Our larger picture with the same light source under these conditions is reduced to only 36% of the level we originally had, when using 1.37:1 (No. 1) aspect ratio aperture and a 15 x 20.5 picture field.

This same formula is applicable to determine the approximate results that will follow the changes from a standard sound 1.37:1 aspect ratio aperture to the apertures designated as Nos. 2, 3, 4, 5 and 10.

2.55/1 (No. 6) CinemaScope vs. 1.37/1 (No. 1) Standard Sound

In order that we keep our evaluations on an even basis, we will retain the same light values, the same picture field size, the same 3-inch, F:1.8 projection lens and light source which we used in the foregoing material covering the aspect ratios Nos. 1, 2, 3, 4, 5, and 10. Consequently, we will start out with a 15 x 20.5-feet picture field obtained from the use of a 1.37:1 standard

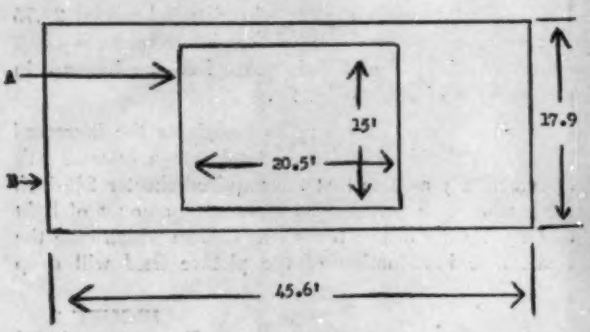


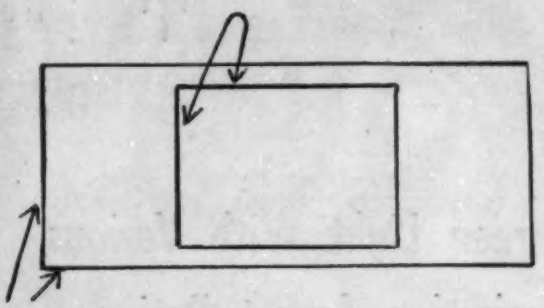
FIGURE 3

sound aperture designated *A* in Fig. 3, and then compare it with a 17.9 x 45.6-feet picture field obtained with the 2.55:1 CinemaScope aperture designated as *B*.

To begin with, because the 2.55:1 CinemaScope uses an aperture opening of 0.715 inches by 0.912 inches in size, the aperture opening area is 32% larger than the standard 1.37:1 sound aperture, hence its total lumen

FIG. 4. Top arrows: original 1.37:1 picture of 15 x 20.5 feet; total area 307.5 square feet, 62 foot-candles, or 100%.

Bottom arrows: final 2.55:1 picture of 17.9 x 45.6 feet; total area 816.2 square feet, 27 foot-candles, or 44%. (NOTE: all figures in "total light," with no allowance for shutter or other losses.)



light-passage rating will rise from 19,000 to 25,000 total screen lumens.

However, because it is necessary in this (No. 6) projection system (also systems No. 7, 8, and 9) to add a prismatic expansion lens to the 3-inch, F:1.8, projection lens, there will follow a loss in the total screen lumen figure (25,000) that will reduce it to 22,000 total screen lumens, or 12%.

This figure of 22,000 now becomes the basis to determine the illumination of the 2.55:1 aspect ratio (17.9 by 45.6-feet) CinemaScope picture field.

Just as a refresher, we restate that the area of our original *A* 1.37:1 ratio, 15 by 20.5-feet picture was 307.5 square feet and that it was illuminated to 62 foot-candles by 19,000 total screen lumens.

For our new CinemaScope 2.55:1 (No. 6) aspect ratio, 17.9 by 45.6-feet *B* picture, its area will be 816.2 square feet, or 165% larger! However, to illuminate this larger area, we have 22,000 total screen lumens, therefore the total foot-candle figure will become 27—which is 56% below the foot-candle illumination of the 1.37:1 (No. 1) 15-feet by 20.5 feet *A* picture field (Fig. 4).

Evaluation of Possible Illumination With Expanded Projection System No. 9

To have a constant basis for comparison, we will continue to keep all projection details as heretofore, thus in

TABLE A

	SYSTEM	ASPECT RATIO	APERTURE OPENING	2 INCH AREA	LIGHT-PASSING RATING
1	Regular	137-1	.600" x .825"	.495"	100
2	"	166-1	.497" x .825"	.410"	83
3	"	175-1	.471" x 825"	.389"	79
4	"	185-1	.446" x .825"	.368"	74
5	"	2-1	.412" x .825"	.340"	69
6	Cinemascope (Magnetic)	2.55-1	.715" x .912"	.652"	132
7	" "	2-1	.715" x .715"	.511"	103
8	Cinemascope (Optical)	2.35-1	.715" x .839"	.600"	121
9	VistaVision (Squeezed)	2-1	.600" x .825"	.495"	100
10	" (Standard)	137-1	.600" x .825"	.495"	100

Carbon Arc Requisites For the New Processes

By H. P. WOODS

The relationship between projector, carbon arc and screen is discussed herein in authoritative fashion by one of England's outstanding technicians. IP is privileged to present these data through the courtesy of its esteemed contemporary, *British Kinematography*—for which, many thanks.

THE projection of wide screen and 3-D films has presented problems in all spheres of projection. An obvious problem has been that of providing a picture of adequate size and brightness within the scope of present-day equipment available for these new techniques. The projector, carbon arc and screen are a group producing a *sensation* of brightness to the eye of the viewer, and it is not possible to divorce these three items when discussing the new methods of film presentation.

Let us first of all examine the properties of the reflecting surfaces used for theatre screens today. It is necessary to refer to a hypothetical surface which we can call a white matte diffusing surface of 100% efficiency, from which all the incident light is reflected.

Screen "Reflection Factor"

If this type of surface is given an illumination of, say, 10 foot-candles, all the light received will be uniformly diffused, so that the light emitted in any direction by the surface is proportional to its projected area in that direction. Because of this, the surface will look just as bright from all angles of viewing, and as the surface is 100% efficient, we would by definition term this brightness as 10 foot-lamberts.

This relation between illumination (foot-candles) and brightness (foot-lamberts) has a factor of 1.0 in the case considered, which is usually termed the "reflection factor" of the surface.

In the practical case of a normal matte theatre screen, some of the

(Continued on next page)

(No. 1) 15 x 20.5-feet screen which, we will recall, was 62 foot-candles.

Fig. 5 we again use as a basis the 1.37:1, 15 x 20.5-feet picture field.

To begin with, because the No. 9 "squeezed" system of VistaVision uses a projector aperture of identical size and area as the standard 1.37:1 (No. 1) sound-picture aperture, its total light-passage rating is likewise 100%. Thus, it will permit 19,000 lumens to enter our 3-inch focus F:1.8 projection lens.

But again we must add a prismatic expansion lens, as is the case with the 2.55:1 CinemaScope system, and therefore we must again deduct 12% from the 19,000 total lumens for its added light loss.

"Working Total" Lumen Figure

Our *working total* lumen figure now becomes 16,700, which will determine the foot-candles of light we will have available to illuminate the 15 x 30-feet VistaVision 2:1 (No. 9) picture field.

As in the foregoing case cited, our original picture field *A* had an area of 307.5 square feet; whereas the new 2:1 (No. 6) VistaVision picture field *B* will have an area of 450 square feet — which is 46% larger!

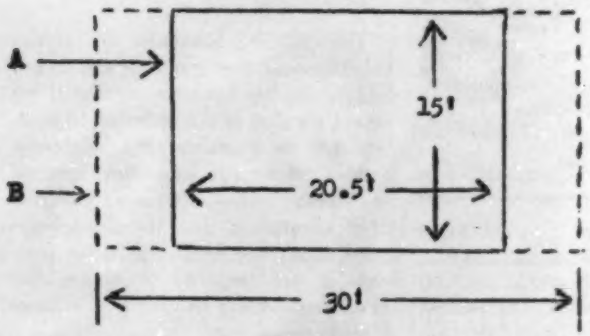


FIGURE 5

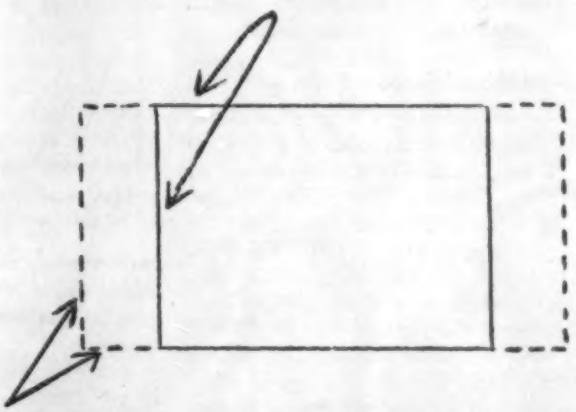


FIG. 6. Top arrows: original 1.37:1 picture of 15 x 20.5 feet; total area 307.5 square feet, 62 foot-candles, or 100%.

Bottom arrows: 2:1 ratio picture of 15 x 30 feet; total area 450 square feet, 37 foot-candles, or approx. 60%. (NOTE: all figures in "total light," with no allowance for shutter or other losses.)

We have 16,700 total screen lumens to illuminate our 46% larger picture area (Fig. 6) thus its level of illumination will be 37 foot-candles, or 40% less, than 1.37:1

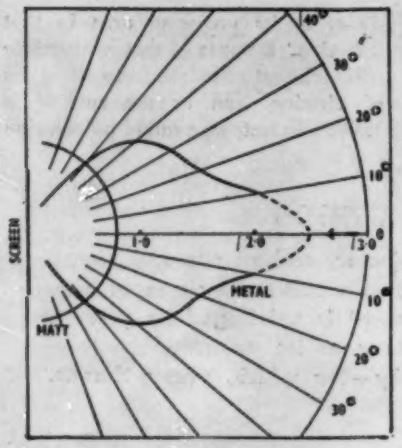


FIG. 1. Horizontal distribution of reflectivity. Normal incidence of light.

incident light is lost to the patron, some having passed both through the screen, and some being absorbed by it. This gives us a reflection factor less than 1.0 in all directions, and it is generally found that a reflection factor (R.F.) of the order of 0.8 is obtained for a new screen when installed. In this case the observed brightness of the screen for an illumination of 10 foot-candles would be 8 foot-lamberts in any direction. The general formula connecting brightness and illumination is:

Brightness (foot-lamberts) = Illumination (foot-candles) × R.F.

Metallized Screen Data

If we examine a typical metallized screen we find that, due to the nature of the surface, the distribution of reflection factor with angle of viewing is quite different from that of a matte screen. Figs. 1 and 2 show the variation of R.F. for normal incidence of light, and for oblique incidence of the light.

On the same diagrams are shown the reflection factor of a typical matte screen. It is observed that at certain angles the R.F. of the metallized screen is considerably in excess of that of a normal matte screen, although it must be realized that the R.F. no longer remains constant at all angles of viewing, so that to some extent the patrons in the side seats will not observe as bright a picture as those in the center. For the same incident illumination a metallized screen will appear twice as bright as a matte screen.

Due to its specular character, the metallized screen surface obeys the normal law of reflection, *i.e.*, angle of incidence = angle of reflection, so that for light incident on the screen at an angle to the normal the screen looks brightest in the direction of the path of the reflected ray. In other words, for steep projection angles of the projector, the patrons in the orchestra will have a brighter picture than does the projectionist.

Illumination of the Screen

As is well known, the illumination of the screen by the straight coppered carbon arc increases progressively with current and carbon size over the positive-size range of 6-mm to 9-mm. The total illumination on the screen (the product of the screen area and the mean foot-candles over the screen) is conveniently expressed in "lumens."

A typical family of curves showing screen lumens plotted against arc current is shown in Fig. 3. It illustrates that, depending upon the grade of

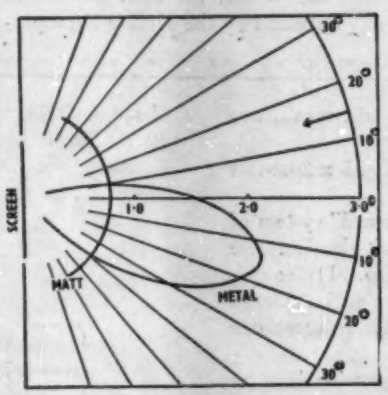


FIG. 2. Vertical distribution of reflectivity. Light incident at 15° to normal.

carbon used, more light may be obtained from one type than another even at the same current, so that a wide choice of carbon size and grade is available for particular conditions in any theatre.

The British Standard of screen brightness refers to the center picture brightness, which in turn is derived from the foot-candles at the center of the screen. For simplicity, a typical distribution of screen illumination can be taken as follows.

Left	Center	Right
50	80	50
70	100	70
50	80	50

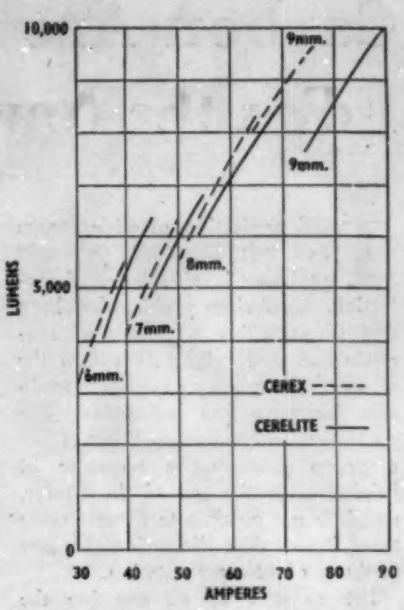


FIG. 3. Screen light curves; 1.33:1 aspect ratio; f/1.9 bloomed lens; 50 per cent flicker shutter cut off.

in which the *average* illumination on the screen is 75% of the centre illumination. Thus, screen lumens = screen area × 0.75 center illumination; therefore, center illumination =

$$\frac{\text{lumens}}{0.75 \times \text{screen area}}$$

From this simple formula it is possible to predict the centre foot-candles from a trim of carbons if the available lumens and screen size are known. Carrying this reasoning a little further, if the width of the screen is W feet, for normal aspect ratio the height is:

$$\frac{0.6}{0.82} W = 0.73\ W$$

Hence the screen area is $W \times 0.73\ W = 0.73 W^2$, from which we obtain:

$$\text{illumination at centre} = \frac{1.82 \text{ lumens}}{W^2}$$

The British Standard of screen brightness at the center of the screen is 8 to 16 foot-lamberts so that if we accept a value of the order of 10 foot-lamberts as a satisfactory brightness (which allows for some deterioration in screen reflectivity and potential light absorption due to atmospheric conditions) the following center foot-candles are required to obtain this brightness on the two types of screens already mentioned.

In the case of the standard new

matte screen, the center illumination should be:

$$\frac{10}{0.8} = 12.5 \text{ foot-candles}$$

and with a typical metallized screen:

$$\frac{10}{1.5} = 6.7 \text{ foot-candles.}$$

Substituting these values in the last equation, curves have been drawn (Fig. 4) to show the lumens required to produce a nominal brightness of 10 foot-lamberts for two typical materials for screens of varying widths. These curves apply to a normal brightness and allow for some deterioration in the reflective properties of the screens with age and at different angles of viewing.

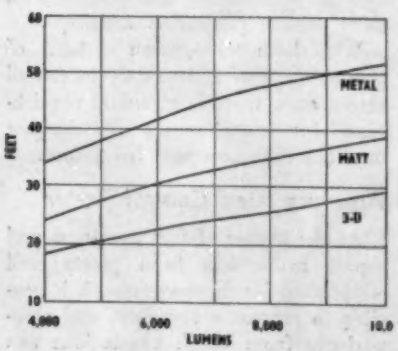
Where aspect ratios are changed by top-and-bottom masking of the gate aperture, the curves still apply, since some of the available light is obviously lost by the introduction of the masking and this light is not redistributed over the wide-aspect-ratio screen.

This does not apply to a projection system such as CinemaScope, where the available light is redistributed over the screen. From the light efficiency standpoint, such systems have a distinct advantage over top-and-bottom masking, and a better picture illumination is obtained for similar screen widths.

From the light output given by the carbon trims available, it may be seen that screens up to 50 feet wide can be illuminated to a very satisfactory level of brightness with the metallized-type of screen.

The normal system of projection of three-dimensional films requires that two images corresponding to right-eye and left-eye views be projected simultaneously onto the screen by plane-polarized light, the planes of polarization of the two pictures being at right angles. By viewing through analyzing spectacles, the right eye can only accept the right-eye picture and the left eye the left-eye picture.

FIG. 4. Screen width vs. lumens; 10 foot-lamberts at center.



We need only consider the system for one projected image and eye, as the two eyes viewing two separate pictures do not make the picture look twice as bright.

The light from the projector passes through a polarizing filter, only about 38% of the light emerging as plane-polarized light. The picture produced by this light is viewed through the approximate spectacle filter which transmits about 80% of the plane-polarized light. This means that as far as the viewer is concerned the light is reduced by some 70%. Because a matte screen to some extent depolarizes the plane-polarized light, so that a double image would be seen, only the metallized screen is suitable, and as it has the added advantage of a higher reflection factor it, to a large extent, offsets the losses due to polarization.

Using the formula previously developed and allowing for the filter factors of the polarizer and viewer, it is possible to calculate the lumens required to illuminate screens of various widths. This is shown in Fig. 4, in which it must be appreciated that some 8000 lumens are required to give a 10 foot-lambert picture 25 feet wide. With lower output from the arc-lamp, either smaller pictures must be projected or a lower brightness tolerated. It is evident that 3-D presents a greater light-problem than wide screen or CinemaScope.

Film Damage a Vital Factor

The demand for more light for 3-D and wide screen means that the film itself is subjected to a greater intensity of light. Already with our normal arclamps we are at the point where film buckle or embossing, with its attendant out-of-focus effects, can be seen during projection. This effect is more noticeable with black-and-white films than with color, as the latter transmits more infra-red radiation.

When using carbon trims designed for the higher light values, it will be necessary to reduce film heating by using infra-red filters, which have the effect of reducing the infra-red rays more than the visible rays so that the film is kept cooler. There is some loss of visible light too, but this may be offset by a small increase in arc current.

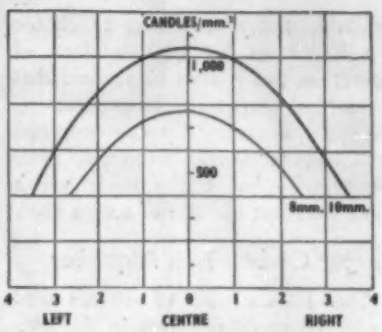


FIG. 5. Distribution of crater brilliancy.

As the filter absorbs a large amount of heat energy, suitable cooling of the filter by air blast is indicated to prevent fracture.

Arc-Trim Running Time

In the case of wide screen or CinemaScope projection using standard reels with running times of the order of 20 minutes, all the carbon trims discussed have burning rates which allow for adequate projection time in the average arclamp. However, where only two projectors are available for 3-D presentation, and longer running time without retrimming is required, some compromise must be made.

Running time is a function of carbon-burning rate, and feed travel of the carbon holders. The latter varies considerably from lamp to lamp, and it is necessary to consider each lamp and choose a trim to allow the time to be achieved.

For burning times of the order of 50 minutes, the burning rate of the positive carbon is usually the limiting factor. In this case, the use of 9-mm positive carbons gives an advantage, as by a suitable choice of current a low burning rate may be obtained with an advantage in light output over that of the smaller sizes of carbons. This is illustrated in the following table.

Positive Size	Burning Rate in./hr.	Current	Light
9-mm	10.5	65	100
8-mm	10.5	59	92
7-mm	10.5	48	78

The sizes and types of carbons

available today enable us to choose the best trim for all conditions of operation, but it must be realized that more light output and longer running time are diametrically opposed, and with conventional arclamps some compromise has to be made which must influence the size of screen used.

Larger Carbon Trim Requisites

The introduction of 10-mm and larger coppered positives in the conventional straight-arc lamps may require some modifications of the lamp to give satisfactory performance. To achieve any worthwhile increase in screen light over that of the 9-mm positives requires current values of more than 100 amperes. To obtain a satisfactory steadiness under these conditions of burning, a very carefully-adjusted magnetic control is required, otherwise the handling of the trim during burning is very sensitive. In lamps with the negative inclined at an angle, the arc is somewhat easier to regulate.

At the same time the lamp optics should be designed to use the larger crater to its best advantage. A mirror designed to give adequate gate coverage with 7-mm and 8-mm positives would have a relatively greater wastage of light at the gate when used with the larger craters produced on 10-mm carbons.

Lamps with Rotating Positives

10-mm and larger positives are now burned in rotating-positive lamps which are modified versions of the prewar lamps involving in some cases the use of water-cooled jaws and reduced protrusion of positive beyond the jaws. Special carbons designed for these lamps are burned at much higher current densities than before, producing high crater brilliancies and high burning rates.

In some cases "fast" 16-inch mirror systems are used to collect the crater light, while others, particularly the larger positives, have condenser systems. The high crater brilliancy and large crater of these arcs produce higher light values, which are most suitable for the illumination of large screens.

Figure 5 shows the distribution of crater brilliancy of a trim of 10-mm rotating positives with 9-mm negatives burning at 120 amperes as compared with that of a standard 8-mm copper-coated carbon at the nominal current of 65 amperes.

The 10-mm carbon produces a maximum crater brilliancy of the order of 1150 as against 790 candlepower per square mm. by the conventional trim. A high intrinsic brilliancy is maintained with the larger carbon over a much larger area than on the 8-mm positive. This enables a high level of luminous flux to be produced with a suitable optical-collecting system.

It is essential, of course, that with this source of high-intensity light, suitable heat-absorbing filters are used between the film and the lamphouse.

Recapitulation of Data

If the conventional arclamps available today are combined with the new types of metallized screen, adequate screen brightnesses are obtainable on screens exceeding 50 feet in width.

In the case of 3-D presentation, due to the light losses in the polarizing and viewing filters, smaller screens up to 28 feet wide have been accepted, unless a lower standard of screen luminance is tolerated. In most cases the use of 9-mm positives is recommended on the score of light output vs. burning rate.

Where longer burning time is required for 3-D using only two projectors, some reduction in screen size is necessary if screen luminance is to be maintained, as the carbon trims have generally to be run below their maximum ratings to accommodate the available feed-travel.

Larger trims of carbons of the rotating type are available for suitable lamps to produce higher luminous output where required. This type of arc, due to its higher light output, makes the use of infra-red filters essential in order that film damage due to heating at the gate may be eliminated.

The performance figures indicated are not the maximum possible but are those of established and tried arcs giving practical results in theatres.

Researches show that higher values of light output are possible when they are required but their use may be limited by the potential damage to film despite the use of heat-absorbing filters.

Light Requirements for Wide-Screen Projection

By ARTHUR J. HATCH
Strong Electric Corporation

THAT the wide screen is here to stay is confirmed by the policies and commitments of major film producers to release their future better pictures either in the CinemaScope or VistaVision processes. With a blessing on these two systems given by most film producers, the exhibitor can proceed to equip his theatre secure in the knowledge that the equipment he purchases will be suitable for the projection of whatever wide-screen system may eventually prevail.

Those theatres already equipped for CinemaScope have learned whether or not they have ample screen illumination on the basis of their screen size. Theatres that have not as yet installed a large screen and may or may not have suitable projection lamps can approach the problem of solving their light requirements from two angles: first, that of determining how much light they will need to project a picture of the size which they intend to install; or second, determining how large a picture they can present with their present projection arclamps.

With both wide-screen systems of projection with their vastly increased screen area, there is a general requirement for more screen illumination than has been necessary heretofore.

Aperture Area Control Factor

As the matter of film apertures and aspect ratios has been pretty well established for these systems, it is possible to present a few facts and comparisons from which conclusions can

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the sponsors of this revolutionary form of motion picture presentation which has revitalized and strengthened immeasurably the standing of our industry throughout the world, salute the technicians who contributed so abundantly of their talents to the overwhelming success of CinemaScope.

A special nod of appreciation is due theatre projectionists, whose craftsmanship was a vital factor in the widespread pnblic acceptance of this new form of entertainment.

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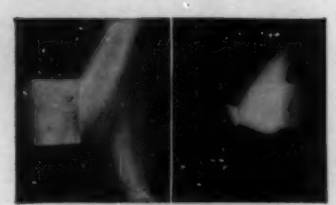

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be drawn that will obviate a period of expensive experimentation.

It is generally recognized that the maximum amount of light that can be put through present projection systems using existing designs of powerful arclamps and optical systems depends principally upon one factor, the area of the aperture. For instance, using the most powerful lamps, it is usually possible to put about 6500 lumens through a 16-mm aperture. Using the same lamp it is possible to project approximately 23,500 lumens through a 35-mm aperture, which has about 4 times the area of the 16-mm aperture.

Since the amount of light which is available to the screen depends primarily upon the area of the picture aperture, to compare the requirements of the various projection systems it becomes necessary to examine them on the basis of aperture area.

Comparison of Aperture Areas

Most of the wide-screen systems proposed use either an anamorphic type lens to expand the size of the picture, or a cut-down aperture to accomplish the extended picture ratio. For instance, the non-anamorphic VistaVision system makes use of an aperture which is 0.825 inch wide (the same as the standard motion picture aperture which has been in use since the advent of sound) by 0.446 inch high. These dimensions give an aspect ratio of 1.85 to 1 to the picture when projected with a non-anamorphic lens. This aperture has an area of 0.368 square inch.

The system whereby VistaVision employs anamorphic prints uses the present standard aperture 0.825 in. by 0.600 in. and obtains the wide-screen effect with an anamorphic lens that has a magnification of 1½ to 1. As the ratio of the standard aperture is 1.33 to 1 and is anamorphized with a 1½ to 1 ratio, the total aspect ratio of the final projected picture is 2 to 1. This standard aperture has an opening area of 0.495 square inch.

Values of Various Systems

The CinemaScope projection system makes use of a still larger aperture, one that is 0.912 x 0.715 inch. The extending of the width of this aperture was made possible by relocating the sound tracks, as was done with the stereophonic magnetic sound on the CinemaScope print. The area of this aperture is 0.652 square inch, the largest of the systems used for general release and consequently it will pass the most illumination. The CinemaScope aperture has an aspect ratio of 1.27 to 1, and is used in connection with a 2 to 1 magnification anamorphic lens to give the projected picture a resultant ratio of 2.55 to 1—if elected.

The recent decision to release optical prints in CinemaScope necessitates the uses of an 0.839 by 0.715 inch aperture, or a ratio of 1.17 to 1, which when projected by the regular 2:1 anamorphic lens results in a picture aspect ratio of 2.35:1. Area of this aperture is 0.600 square inch.

Comparing the light that can be put through these four apertures, we have the old standard-width, cut-down VistaVision aperture with a 1.85 to 1 ratio to which we will assign a value of 100 units, based on the area of 0.368 square inch. Accordingly, to the 0.825 x 0.600 aperture used with the 1½-to-1 ratio anamorphic lens, and which has an area of 0.495 square inch, we must assign a value of 135 units, since this size aperture passes 35% more light than the first-described aperture. It follows then that the CinemaScope optical track aperture, with an area of 0.600 square inch rates 163 units, since it projects 63% more light than the first-described aperture.

The CinemaScope magnetic print aperture with an area of 0.652 square inch projects 77% more light than the first-described aperture, or 177 units.

Since the powerful lamp referred to previously, without projector shutter running, puts 17,500 lumens through the non-anamorphic VistaVision aperture, it follows that 23,500 lumens can be put through the anamorphic VistaVision aperture; 28,500 through the optical CinemaScope aperture, and 31,000 lumens through the CinemaScope magnetic print aperture.

Screen Widths Possible

Taking the example of a drive-in theatre which has been equipped with the most powerful arclamps projecting to a 66 x 50 foot white screen with the standard 1.33:1 aspect ratio, it is interesting to compare the size of pictures that can be obtained with each of these new wide screen projection systems to obtain the identical unit brightness on the screen in all cases.

Taking the case of the non-anamorphic VistaVision system and assuming that the picture will be projected to a matte white painted screen, the width of the screen that can be utilized would be 66 feet. In the case of anamorphic-type VistaVision, the width of the screen that can be accommodated would be 78 feet wide; optical-print CinemaScope screen width could be 92 feet, and in the instance of magnetic-track CinemaScope the screen width could be 100 feet. All figures given for systems using anamorphic lenses have recognized the existence of a light loss of about 8% introduced by the anamorphic lens attachment.

If the screen, instead of having a

SUMMARY OF WIDE-SCREEN PROJECTION SYSTEMS

NOTE: THE VALUE OF 4-FT. LAMBERTS APPLIES ONLY TO DRIVE-IN THEATRES.

System	Aperture Size	Aperture in Sq. In.	Lumens Thru Aperture	Type of Screen	Aspect Ratio	Screen Size: 4-ft. Lamberts at Center	Width Ratio Factor
Standard VistaVision non-anamorphic	0.825 x 0.600	0.495	23,500	matte white	1.33:1	66 x 50	1.00
VistaVision anamorphic	0.825 x 0.446	0.368	17,500	matte white	1.85:1	66 x 36	1.00
VistaVision non-anamorphic	0.825 x 0.600	0.495	23,500	matte white	2:1	78 x 39	1.18
CinemaScope anamorphic optical sound	0.825 x 0.446	0.368	17,500	aluminized	1.85:1	89 x 48	1.35
CinemaScope anamorphic magnetic sound	0.839 x 0.715	0.600	28,500	matte white	2.35:1	92 x 39	1.40
VistaVision anamorphic	0.912 x 0.715	0.652	31,000	matte white	2.55:1	100 x 39	1.52
CinemaScope anamorphic optical sound	0.825 x 0.600	0.495	23,500	aluminized	2:1	102 x 51	1.55
CinemaScope anamorphic magnetic sound	0.839 x 0.715	0.600	28,500	aluminized	2.35:1	122 x 52	1.85
	0.912 x 0.715	0.652	31,000	aluminized	2.55:1	133 x 52	2.00

matte white surface, is an aluminized paint surface with a reflection factor of approximately 1.4, the non-anamorphic VistaVision picture width could be 89 feet; the anamorphic VistaVistion 102 feet, the CinemaScope optical picture 122 feet, and the CinemaScope magnetic track picture 133 feet in width, which incidentally, is about the maximum size that is being used in present day drive-ins.

The accompanying chart shows these various figures for the different types of projection systems and different types of screens. All the figures shown are based on the use of the most powerful projection arclamp available today, and the sizes of the screen are calculated so that a brightness of 4 foot-lamberts will be obtained in the center of the screen when the shutter is running. This figure of 4 foot-lamberts is a little bit above the average brightness we find in most drive-in theatres today.

Screen Brightness Levels

To explain how these screen widths have been arrived at, take, for example, the magnetic-track CinemaScope system which is calculated to have a 133-foot width for 4 foot-lamberts center brightness.

When the center brightness on a screen is 4 foot-lamberts, and with the typical distribution pattern, the average brightness over the whole surface of the screen is found by test to be 2.9 foot-lamberts.

With the screen having a reflective factor of 1.4, it is only necessary to project 2.05 foot-candles to the screen to realize that 2.9 foot-lamberts brightness. The 31,000 lumens which this powerful lamp can deliver through a CinemaScope aperture and standard f/2.0 optics is reduced by the 50% shutter loss and the 8% anamorphic lens loss, so that the incident light on the screen is 14,350 lumens.

Width-Ratio Factor

Therefore, since lumens are the product of average foot-candles x screen area, we obtain the area that we can illuminate to this 2.05 foot-candles intensity by dividing 14,350 by 2.05 for a resulting screen area of 7000 square feet. The picture width can be computed by taking the square root of the product of screen area times screen aspect ratio, which in the example cited calculates to 133 feet wide. The other calculations in the chart were made in a similar manner for the other projection systems and screens.

Assuming any particular theatre to have ample screen illumination on a matte screen using standard-size aperture, the screen width that can be illuminated to the same brightness for any of the wide-screen systems can be calculated by multiplying the present screen width by the "width ratio factor" given in the last column of the accompanying chart.

For example, if your own theatre presently has a 50-foot wide picture with standard projection on a white screen, and you wish to determine the width of matte white screen that can be illuminated to the present level of brightness with the VistaVision anamorphic system, simply take the present standard picture width and multiply it by the "width-factor ratio" of 1.18 from the chart. The resultant width in this example would be 59 feet.

The illusion of *living presence*, the sole advantage of all the new screen techniques, can only be realized with an increase of screen width of from 1.75 to 2 times over that heretofore employed for standard projection.

Accordingly, it is readily evident that most theatres will require the most modern and powerful projection arcs in order to meet the requirements of a sufficiently increased screen width for proper presentation of all wide screen techniques.

Your Guide to Proper Lens Selection

By M. D. O'BRIEN
Director of Sound and Projection, Loew's Theatres

WITH VistaVision and other wide-screen processes looming large on the technological horizon, the selection of the proper projection optics is of vital importance—not tomorrow, not next week, not next month but *now!* We projectionists understand that these optics are in the wide-angle, short-focal length category.

As the only technically-minded personnel in and about the theatre, the projectionist craft is now called upon to discarge a very serious obligation. The charts and accompanying text presented here afford precise information as to the proper lens for a given screen width at a given projection "throw."

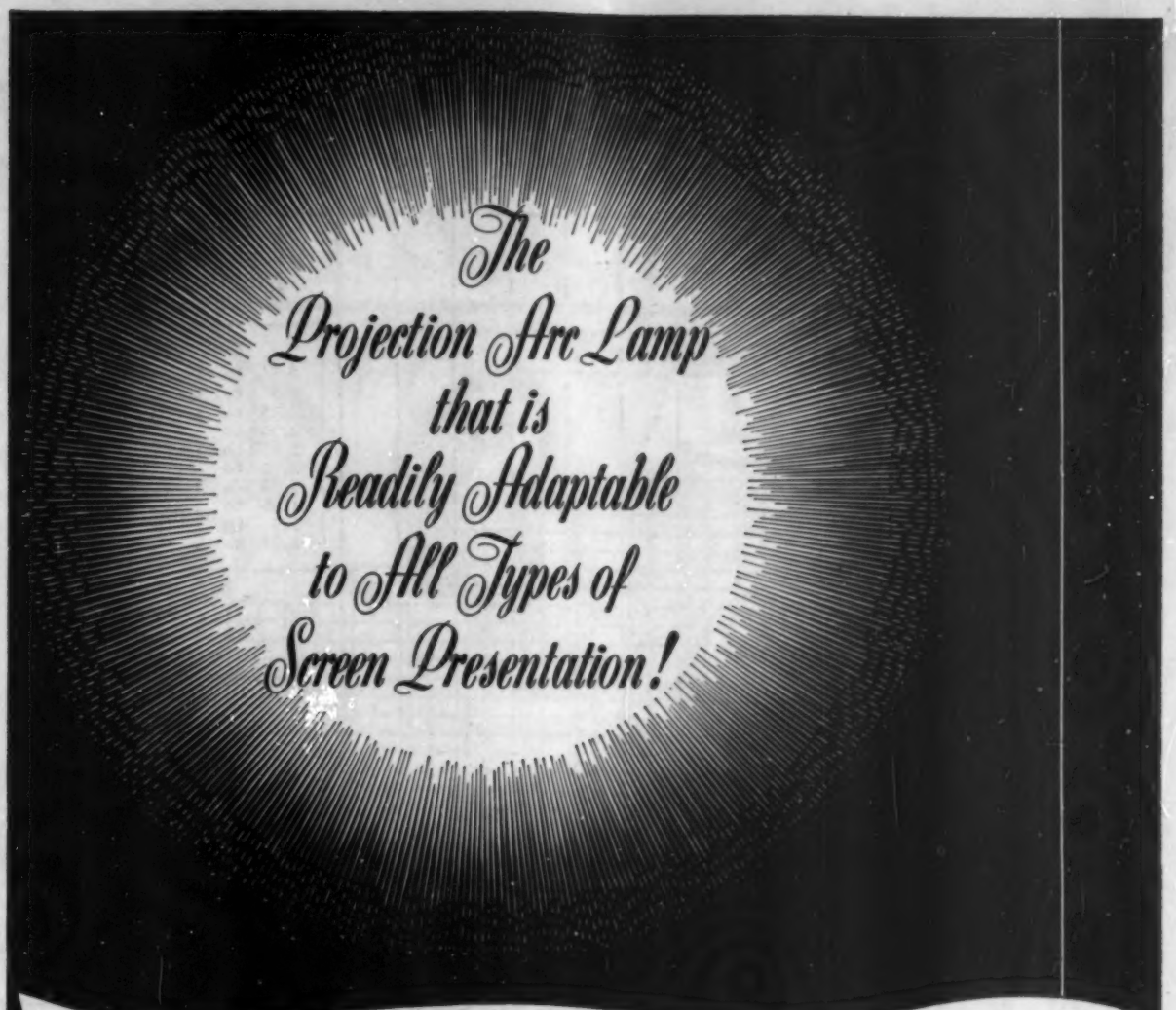
Constantly possed are such questions as: What focal-length lens is needed to get, for example, a 40-foot picture in a theatre where the throw is 125 feet and the proscenium arch is 20 feet high? The catch here is that with a 40-foot wide picture in such a theatre, all pictures would have to be shown in an aspect ratio of at least 2 to 1. Therefore a compromise must be made.

To answer questions of this kind quickly and, at the same time, accurately, the writer prepared the charts shown herein. Let us consider the first chart. If, for instance, a projectionist wants to know what focal-length lens would be required to obtain a picture 40-feet wide in his theatre if the throw is 125 feet, he can find out by reading down the left-hand column to 125 feet and then reading across to the column listing lenses for a 40-foot screen.

There he will find that a 2.6-inch lens would be needed to get exactly this size picture in this particular situation. However, since projection lenses are generally available only in quarter-inch sizes, exactly this size picture cannot be obtained. It would be necessary to compromise on a slightly large picture using a 2.5-inch lens, or a slightly smaller picture using a 2.75-inch lens.

Height-to-Width Relationship

The second chart determines the height of a picture of a specified width when various aspect ratios are used. It is useful in coping with situations such as the following: As mentioned previously, a picture 40-feet wide in a theatre where the proscenium arch is only about 20 feet high, would result in a situation where all pictures would have to be shown in an aspect ratio of at least 2 to 1, and few pictures are now available that can be masked that much



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The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.

Unit construction permits easy removal of the elements for inspection in servicing.

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at the aperture without cutting off action.

In the upper righthand corner of the first chart is a box listing the aperture sizes required to project various aspect ratios. Extreme ratios such as 2.66 to 1 or 2.5 to 1 are included, although at present they probably are not feasible. The light loss and, of course, the fact that large sections of the picture would be cut off would make such projection impractical.

Height-to-width ratios as extreme as this are obtained in the CinemaScope process through using a full aperture and an anamorphic lens.

Setting up a high-quality wide-screen system can be a tricky process. Other important factors are the sight lines from the rear of the auditorium, the balcony and other parts of the theatre.

THROW	SCREEN WIDTHS																
	20'	22'	25'	27'	30'	32'	35'	37'	40'	42'	45'	47'	50'	52'	55'	57'	60'	62'	65'
					LENS SIZES														
50	2.1	1.9																	
55	2.3	2.1																	
60	2.5	2.3	2.0																
65	2.7	2.4	2.1	2.0															
70	2.9	2.6	2.3	2.1	1.9														
75	3.1	2.8	2.5	2.3	2.1	1.9													
80	3.3	3.0	2.6	2.4	2.2	2.1	1.9												
85	3.5	3.2	2.8	2.6	2.3	2.2	2.0	1.9											
90	3.7	3.4	3.0	2.8	2.5	2.3	2.1	2.0	1.9										
95	3.9	3.6	3.1	2.9	2.6	2.4	2.2	2.1	2.0	1.9									
100	4.1	3.8	3.3	3.1	2.8	2.6	2.4	2.2	2.1	2.0									
105	4.3	3.9	3.5	3.2	2.9	2.7	2.5	2.3	2.2	2.1	1.9								
110	4.5	4.1	3.6	3.4	3.0	2.8	2.6	2.5	2.3	2.2	2.0	1.9							
115	4.7	4.3	3.8	3.5	3.2	3.0	2.7	2.6	2.4	2.3	2.1	2.0	1.8						
120	5.0	4.5	4.0	3.7	3.3	3.1	2.8	2.7	2.5	2.4	2.2	2.1	2.0						
125	5.2	4.7	4.1	3.8	3.4	3.2	2.9	2.8	2.6	2.5	2.3	2.2	2.1						
130	5.4	4.9	4.3	4.0	3.6	3.4	3.1	2.9	2.7	2.6	2.4	2.3	2.1						
135	5.6	5.1	4.5	4.1	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.4	2.2						
140	5.8	5.3	4.6	4.3	3.9	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.3						
145	6.0	5.4	4.8	4.4	4.0	3.7	3.4	3.2	3.0	2.8	2.7	2.5	2.4						
150	6.2	5.6	5.0	4.6	4.1	3.9	3.5	3.3	3.1	2.9	2.8	2.6	2.5						
155	6.4	5.8	5.1	4.7	4.3	4.0	3.7	3.5	3.2	3.0	2.8	2.7	2.6						
160	6.6	6.0	5.3	4.9	4.4	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6						
165	6.8	6.2	5.4	5.0	4.5	4.3	3.9	3.7	3.4	3.2	3.0	2.9	2.7						
170	7.0	6.4	5.6	5.2	4.7	4.4	4.0	3.8	3.5	3.3	3.1	3.0	2.8						
175	7.2	6.6	5.8	5.3	4.8	4.5	4.1	3.9	3.6	3.4	3.2	3.1	2.9						
180	7.4	6.8	5.9	5.5	5.0	4.6	4.2	4.0	3.7	3.5	3.3	3.2	3.0						
185	7.6	6.9	6.1	5.7	5.1	4.8	4.4	4.1	3.8	3.6	3.4	3.2	3.1						
190	7.8	7.1	6.3	5.8	5.2	4.9	4.5	4.2	3.9	3.7	3.5	3.3	3.1						
195	8.0	7.3	6.4	6.0	5.4	5.0	4.6	4.3	4.0	3.8	3.6	3.4	3.2						
200	8.3	7.5	6.6	6.1	5.5	5.2	4.7	4.5	4.1	3.9	3.7	3.5	3.3						

APERTURE SIZES		
2.66 to 1	.310	x .825
2.5 to 1	.330	x .825
2.25 to 1	.366	x .825
2.00 to 1	.412	x .825
1.85 to 1	.446	x .825
1.78 to 1	.463	x .825

This table shows the size of the lens required in order to obtain a screen size of the desired width at any projection throw. shows the exact d

Width	1.50	1.66	1.75	1.78	1.85	2.00	2.			
20	13.3	12	11.4	11.2	10.8	10.0	9.			
22	14.6	13.2	12.6	12.4	11.9	11.0	9.			
25	16.6	15.	14.3	14.0	13.5	12.5	11.			
27	18.0	16.2	15.4	15.2	14.6	13.5	12.			
30	20.0	18.	17.1	16.9	15.2	15.0	13.			
32	21.3	19.2	18.3	18.0	17.3	16.0	14.			
35	23.3	21.	20.0	19.7	18.9	17.5	15.			
37	24.6	22.2	21.1	20.8	20.0	18.5	16.4	16.8	15.9	14.1
40	26.6	24.	22.8	22.5	21.6	20.0	17.8	16.0	15.0	29.0
42	28.0	25.3	24.0	23.6	22.7	21.0	18.7	16.8	15.7	30.0
45	30.0	27.1	25.7	25.3	24.3	22.5	20.0	18.0	16.9	32.6
47	31.3	28.3	26.9	26.4	25.4	23.5	20.9	18.8	17.7	34.0
50	33.3	30.	28.6	28.1	27.0	25.0	22.2	20.0	18.8	36.1
52	34.6	31.3	29.7	29.2	28.1	26.0	23.1	20.8	19.5	37.6
55	36.6	33.1	31.4	30.9	29.7	27.5	24.4	22.0	20.8	40.0
57	38.0	34.3	32.6	32.0	30.8	28.5	25.3	22.8	21.4	41.4
60	40.0	36.1	34.2	33.7	32.4	30.0	26.7	24.0	22.6	43.8
62	41.3	37.3	35.4	34.8	33.5	31.0	27.6	24.8	23.3	45.0
65	43.3	39.1	37.1	36.5	35.1	32.5	28.9	26.0	24.4	47.2

This table shows the height to within 1/10th of a foot of the screen in relation to its width and to the aspect ratio of the projected image. Figures on top line of each column relate to the specific aspect ratio.

WA
PA

FAIRCHILD ANSWERS

AVY

GES

A. It sure is! M-G-M, Paramount and Warners are releasing all future productions with Perspecta Sound. Other studios are following.

Q. *Will it be the industry standard for years to come?*

es, it will – because, from the producers' point, it's the *compatible* system – yet exhibitors the finest stereophonic sound e lowest installation and operating cost.

ow soon should theatre owners install it?
he sooner, the better. All Loew's theatres eing equipped now and hundreds of here and abroad have ordered! Be first community. Order now!

ow many Fairchild Perspecta Integrators a theatre need?
nly *one!* A single Fairchild Perspecta rator serves *all* projectors in a booth and ols the sound through any three-channel system of standard-make.

hat about costs and installation time?
he Fairchild Perspecta Integrator costs . A complete installation can be made in han a day – without loss of showing time incidentally, without continued maintenance and replacement of magnetic heads!

Q. *Where do I go to find out more?*
A. See your dealer or – call – write – or wire Fairchild. We understand exhibitors' problems—can answer your questions immediately.

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THEATRE EQUIPMENT DIVISION • WHITESTONE 57, NEW YORK

at the aperture without cutting off action.

In the upper righthand corner of the first chart is a box listing the aperture sizes required to project various aspect ratios. Extreme ratios such as 2.66 to 1 or 2.5 to 1 are included, although at present they probably are not feasible. The light loss and, of course, the fact that large sections of the picture would be cut off would make such projection impractical.

Height-to-width ratios as extreme as this are obtained in the CinemaScope process through using a full aperture and an anamorphic lens.

Setting up a high-quality wide-screen system can be a tricky process. Other important factors are the sight lines from the rear of the auditorium, the balcony and other parts of the theatre.

THROW	SCREEN WIDTHS →																
	20'	22'	25'	27'	30'	32'	35'	37'	40'	42'	45'	47'	50'	52'	55'	57'	60'	62'	65'
50	2.1	1.9			LENS SIZES														
55	2.3	2.1																	
60	2.5	2.3	2.0																
65	2.7	2.5	2.1	2.0															
70	2.9	2.6	2.3	2.1	1.9														
75	3.1	2.8	2.5	2.3	2.1	1.9													
80	3.3	3.0	2.6	2.4	2.2	2.1	1.9												
85	3.5	3.2	2.8	2.6	2.3	2.2	2.0	1.9											
90	3.7	3.4	3.0	2.8	2.5	2.3	2.1	2.0	1.9										
95	3.9	3.6	3.2	2.9	2.6	2.4	2.2	2.1	2.0	1.9									
100	4.1	3.8	3.3	3.1	2.8	2.6	2.4	2.2	2.1	2.0									
105	4.3	3.9	3.5	3.2	2.9	2.7	2.5	2.3	2.2	2.1	1.9								
110	4.5	4.1	3.6	3.4	3.0	2.8	2.6	2.5	2.3	2.2	2.0	1.9							
115	4.7	4.3	3.8	3.5	3.2	3.0	2.7	2.6	2.4	2.3	2.1	2.0	1.9						
120	5.0	4.5	4.0	3.7	3.3	3.1	2.8	2.7	2.5	2.4	2.2	2.1	2.0	1.9					
125	5.2	4.7	4.1	3.8	3.4	3.2	2.9	2.8	2.6	2.5	2.3	2.2	2.1	2.0	1.9				
130	5.4	4.9	4.3	4.0	3.6	3.4	3.1	2.9	2.7	2.6	2.4	2.3	2.1	2.1	2.0	1.9			
135	5.6	5.1	4.5	4.1	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.4	2.2	2.1	2.0	2.0	1.9		
140	5.8	5.3	4.6	4.3	3.9	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.3	2.2	2.1	2.0	1.9	1.9	
145	6.0	5.4	4.8	4.4	4.0	3.7	3.4	3.2	3.0	2.8	2.7	2.5	2.4	2.3	2.2	2.1	2.0	1.9	
150	6.2	5.6	5.0	4.6	4.1	3.9	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
155	6.4	5.8	5.1	4.7	4.3	4.0	3.7	3.5	3.2	3.0	2.8	2.7	2.6	2.5	2.3	2.2	2.1	2.1	2.0
160	6.6	6.0	5.3	4.9	4.4	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0
165	6.8	6.2	5.4	5.0	4.5	4.3	3.9	3.7	3.4	3.2	3.0	2.9	2.7	2.6	2.5	2.4	2.3	2.2	2.1
170	7.0	6.4	5.6	5.2	4.7	4.4	4.0	3.8	3.5	3.3	3.1	3.0	2.8	2.7	2.6	2.5	2.3	2.3	2.2
175	7.2	6.6	5.8	5.3	4.8	4.5	4.1	3.9	3.6	3.4	3.2	3.1	2.9	2.8	2.6	2.5	2.4	2.3	2.2
180	7.4	6.8	5.9	5.5	5.0	4.6	4.2	4.0	3.7	3.5	3.3	3.2	3.0	2.9	2.7	2.6	2.5	2.4	2.3
185	7.6	6.9	6.1	5.7	5.1	4.8	4.4	4.1	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.5	2.5	2.3
190	7.8	7.1	6.3	5.8	5.2	4.9	4.5	4.2	3.9	3.7	3.5	3.3	3.1	3.0	2.9	2.8	2.6	2.5	2.4
195	8.0	7.3	6.4	6.0	5.4	5.0	4.6	4.3	4.0	3.8	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.6	2.5
200	8.3	7.5	6.6	6.1	5.5	5.2	4.7	4.5	4.1	3.9	3.7	3.5	3.3	3.2	3.0	2.9	2.8	2.7	2.5

APERTURE SIZES		
2.66	to 1	.310 x .825
2.5	to 1	.330 x .825
2.25	to 1	.366 x .825
2.00	to 1	.412 x .825
1.85	to 1	.446 x .825
1.78	to 1	.463 x .825
1.75	to 1	.471 x .825
1.66	to 1	.497 x .825
1.5	to 1	.550 x .825
1.37	to 1	.600 x .825

This table shows the size of the lens required in order to obtain a screen size of the desired width at any projection throw. The box in the upper right corner shows the exact dimensions of wide-screen apertures.

Width	1.50	1.66	1.75	1.78	1.85	2.00	2.25	2.50	2.66	STANDART
20	13.3	12	11.4	11.2	10.8	10.0	8.9	8.0	7.5	14.5
22	14.6	13.2	12.6	12.4	11.9	11.0	9.8	8.8	8.3	16.0
25	16.6	15.	14.3	14.0	13.5	12.5	11.1	10.0	9.4	18.1
27	18.0	16.2	15.4	15.2	14.6	13.5	12.0	10.8	10.1	19.6
30	20.0	18.	17.1	16.9	15.2	15.0	13.3	12.0	11.3	21.8
32	21.3	19.2	18.3	18.0	17.3	16.0	14.2	12.8	12.0	23.2
35	23.3	21.	20.0	19.7	18.9	17.5	15.6	14.0	13.2	25.4
37	24.6	22.2	21.1	20.8	20.0	18.5	16.4	14.8	13.9	26.9
40	26.6	24.	22.8	22.5	21.6	20.0	17.8	16.0	15.0	29.0
42	28.0	25.3	24.0	23.6	22.7	21.0	18.7	16.8	15.7	30.0
45	30.0	27.1	25.7	25.3	24.3	22.5	20.0	18.0	16.9	32.6
47	31.3	28.3	26.9	26.4	25.4	23.5	20.9	18.8	17.7	34.0
50	33.3	30.	28.6	28.1	27.0	25.0	22.2	20.0	18.8	36.1
52	34.6	31.3	29.7	29.2	28.1	26.0	23.1	20.8	19.5	37.8
55	36.6	33.1	31.4	30.9	29.7	27.5	24.4	22.0	20.8	40.0
57	38.0	34.3	32.6	32.0	30.8	28.5	25.3	22.8	21.4	41.4
60	40.0	36.1	34.2	33.7	32.4	30.0	26.7	24.0	22.6	43.6
62	41.3	37.3	35.4	34.8	33.5	31.0	27.6	24.8	23.3	45.0
65	43.3	39.1	37.1	36.5	35.1	32.5	28.9	26.0	24.4	47.2

This table shows the height to within 1/10th of a foot of the screen in relation to its width and to the aspect ratio of the projected image. Figures on top line of each column relate to the specific aspect ratio.

FAIRCHILD ANSWERS

6 Pointed Questions About PERSPECTA STEREOPHONIC SOUND

A FRANK DISCUSSION OF THE FACTS!

Q. *Is Perspecta Stereophonic Sound really here?*
A. It sure is! M-G-M, Paramount and Warners are releasing all future productions with Perspecta Sound. Other studios are following.

Q. *Will it be the industry standard for years to come?*
A. Yes, it will – because, from the producers' viewpoint, it's the *compatible* system – yet offers exhibitors the finest stereophonic sound at the lowest installation and operating cost.

Q. *How soon should theatre owners install it?*
A. The sooner, the better. All Loew's theatres are being equipped now and hundreds of others here and abroad have ordered! Be first in *your* community. Order now!

Q. *How many Fairchild Perspecta Integrators does a theatre need?*
A. Only *one!* A single Fairchild Perspecta Integrator serves *all* projectors in a booth and controls the sound through any three-channel sound system of standard-make.

Q. *What about costs and installation time?*
A. The Fairchild Perspecta Integrator costs $990. A complete installation can be made in less than a day – without loss of showing time and, incidentally, without continued maintenance and replacement of magnetic heads!

Q. *Where do I go to find out more?*
A. See your dealer or – call – write – or wire Fairchild. We understand exhibitors' problems–can answer your questions immediately.

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They like RCA DYNA-LITE SCREENS ... and no wonder

...the new all-purpose silver screen the choice of thousands of theatres

Take it from the sales figures ... RCA Dyna-Lite Screens are now bringing out the best in good pictures for theatre patrons by the million. You'll find the reasons right in Dyna-Lite's construction ... with feature after feature to make Dyna-Lite ideal for any 2-D, 3-D or wide-screen film.

With an RCA Dyna-Lite Screen, there's no light loss ... for its entire surface is uniformly aluminized to add extra brightness. Rugged seams are invisible to the audience, thanks to special electronic welding. And your Dyna-Lite Screen need never show wrinkles. Its tear-proof vinyl plastic can be stretched drum-tight, and seams are extra strong, too.

An RCA Dyna-Lite Screen is flame proof ... as well as highly moisture resistant. It cleans quickly and easily ... with only a duster on the front surface, plus a vacuum on the rear for thorough dust removal.

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The construction and components of various types of photocells are discussed in this the second of a series of three articles.

An Evaluation of Optical Sound

By ROBERT A. MITCHELL

IN 1873, Willoughby Smith, an Englishman, discovered the interesting fact that crystalline selenium, a semi-metallic element resembling sulfur in its chemical properties, changed its resistance to the flow of current with changing illumination. Selenium is a rather poor conductor, but it conducts current about eight times better when light shines on it.

Lead oxysulfide, cadmium sulfide, thallium oxysulfide, and molybdenum sulfide are other substances which display lower electrical resistance when illuminated. Of these, only lead oxysulfide is sufficiently responsive to rapid variations of illumination to be of any use in sound reproducing systems. Selenium "photoconductive" cells are widely used in relay circuits actuated by light, but are useless for sound reproduction.

Another type of photocell, called the "barrier" or "photovoltaic" cell, consists of two dissimilar substances in close contact. In 1883, Charles Fritts of England constructed such a cell by coating selenium with a film of metal so thin as to be semi-transparent. In improved form this cell is the familiar photronic cell used in projection for controlling the feeding of carbons in modern high-intensity reflector arc-lamps.

A copper-oxide photovoltaic cell, known commercially as the Photox cell, is similar. Both of these cells actually *generate* large currents under the influence of light. They are very useful for control applications and photometry — photographers' light meters utilize them — but, like the selenium photoconductive cell, they do not respond to rapid changes in illumination.

The Modern Photocell

Now we come to the "photoemissive" type of photocell, the kind used in soundheads. This kind of cell depends for its operation on the emission of electrons (the fundamental units of electricity) from substances "excited" by light. The history of this cell began in 1887 when Heinrich Hertz, the German physicist who discovered radio waves, found that ultraviolet light falling on a high-voltage spark-gap enabled the spark to pass more easily than when the gap was not illuminated. And in 1888 the observation was made by other scientists that ultraviolet radiation increased the rate of discharge of a negatively-charged body.

It was conclusively proved in 1899 by Philip Lenard of Germany and J. J. Thompson of England, working independently, that *light causes the emission of electrons from substances.* A knowledge of this important principle made possible the invention of the modern photocell.

Lenard continued his investigations of the "photoelectric effect;" and in the course of his researches he construced the first photoemissive cell having a resemblance to the phototubes familiar to projectionists.

Lenard's Photocell

Lenard's photocell consisted of an evacuated quartz-glass bulb in which was placed a freshly-polished zinc plate and a platinum wire to capture electrons emitted from the plate. When the zinc plate was connected to the negative terminal of a high-voltage battery, and the platinum wire to the positive terminal, a sensitive galvanometer in the circuit showed that a small current passed through the vacuum between the zinc plate (cathode) and the wire (anode) when, and *only* when, the zinc was illuminated by ultraviolet light.

Then the discovery was made by Lenard that the ultraviolet-illuminated zinc plate acquired a small positive charge when the cell was *not* connected to the battery. This he correctly interpreted as a release of electrons from the zinc under the influence of radiation. The leakage of electrons continued only until the residual positive charge left on the plate prevented any more electrons from leaving. The high-voltage battery merely replaced the electrons lost from the plate and prevented a positive charge from forming.

The swarms of electrons flying from the cathode (plate) to the anode (wire) could be swerved from their course by magnetic and electric fields. This phenomenon enabled Lenard to discover the interesting fact that the velocity of the emitted electrons is not affected by the intensity of the radiation illuminating the plate but is dependent only on the wavelength of radiation. The shorter the wavelength of the light, the higher the speed of the electrons.

The Nature of Light

These facts suggested to Albert Einstein his *special theory of relativity* in which he postulated that light is composed of separate little bundles of radiant energy called *quanta* which spread farther and farther apart with increasing distance from the source of the light.

One of the offshoots of this far-reaching theory was the Einstein photoelectric equation which contains two terms from which the photoelectric "threshold-frequency" may be calculated. This function represents the longest wavelength capable of causing the emission of electrons from an electric conductor. One of its factors, the photoelectric "work-function," is so great for most metals that only radiation of the shorter wavelengths (such as ultraviolet light) produces emission.

Very few metals are capable of emitting electrons under the influence of visible radiation, and all of these happen to be the rather weird metals of the alkali and alkaline-earth families, namely: Lithium, Sodium, Potassium, Rubidium, Caesium, Vir-

ginium*, Calcium, Strontium, Barium and Radium*.

Chemical compounds of a few of these strange metals are quite common. The chloride of sodium is ordinary salt. Caustic potash is potassium hydroxide. Calcium oxide is quicklime. Salts of strontium and barium are used in colored fireworks. Caesium, the metal used in modern photocells, is rather rare. Important deposits of minerals containing caesium compounds are found in Maine.

Potassium Used First

Potassium was used in the first sound-movie photocells. Pure metallic potassium is a soft, silvery metal that floats on water. To throw a piece of potassium into water is, however, a dangerous experiment because it sometimes explodes. Ordinarily it merely sputters and dances over the surface of water, combining with it so vigorously that the hydrogen gas liberated often catches on fire, burning with a flame colored purple by potassium vapor.

Sodium is also lighter than water, but not quite so active chemically as potassium. It seethes and hisses in water to form a solution of lye, but not enough heat is generated to ignite the hydrogen evolved. Rubidium is even more active than potassium, and caesium is the most hot-tempered.

Caesium is a beautiful, silvery metal, almost twice as heavy as water, and as soft as lead. Like sodium and potassium, caesium must be stored in containers filled with kerosene to protect the active metal from the air. Potassium rusts very quickly in the air, but caesium ignites spontaneously when exposed to air, burning with a bright blue flame and giving off a dense, corrosive smoke of white dust. On a warm day caesium melts to a silvery liquid resembling mercury.

"Noble" Gas Required

In order to use these active metals we must work with them either in a vacuum or in an artificially created atmosphere of some totally inert gas such as helium, neon, or argon. The fierce chemical activity of these metals also prevents their extraction by ordinary metallurgical methods. They are obtained commercially by electrolysis of their melted salts in special high-temperature apparatus which permits collection of the liberated globules of metal in the absence of air.

The curious metals used in producing the light-sensitive surfaces in photocells were described in last month's installment. Let us now examine the old potassium cell and then some of the modern types of photocells. The potassium cell, remembered by projectionists as a silvered bulb-shaped affair requiring an "anode potential" of about 250 volts, is shown in Fig. 3. Devised by the German scientists Elster and Geitel, the bulbous potassium cell was the first ever used for commercial sound-on-film movies.

The empty glass bulb was first silvered internally, and a circular area of silver was removed to provide a window for the admission of light. A very thin layer of potassium was then coated on the silver by vaporization. The finished cell was entirely empty except for a ring, or loop, of wire to serve as the anode to which the electrons stream.

Vacuum-Type Photocells

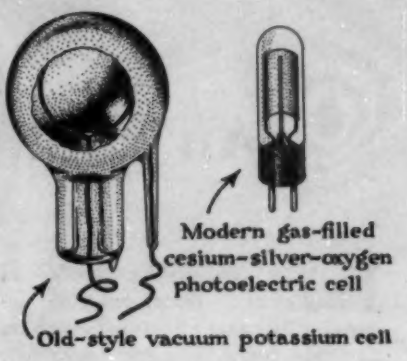
The earliest photocells were completely evacuated. The response-characteristics of vacuum-type phototubes are remarkably "flat," the current output being directly proportional to the intensity of illumination falling upon the cathode of photosensitive metal. Vacuum-type cells of a more modern construction still are manufactured, finding a wide application for wirephoto service, photometric and colorimetric measurements, and relay control. RCA's 934 vacuum phototube is suitable for sound-on-film reproduction.

To increase the sensitivity of the old-style potassium cell, a little oxygen was admitted and a carefully controlled high-voltage glow-discharge produced inside the cell. This treatment left the potassium in a highly sensitive colloidal, or finely divided, state. After pumping out the excess oxygen, a small amount of helium (a chemically inert gas) was introduced into the bulb. This later type of potassium cell, the first of a large family of gas-filled phototubes, was from five to eight times more sensitive than the vacuum cell.

Gas-Filled Cell Action

How does gas at very low pressure make photocells more sensitive? In the vacuum cell all of the electrons which reach the anode and flow off through the wire as a current must come from the photosensitive cathode. When light strikes the cathode, electrons leave the metal and form a cloud in front of it. The voltage-impressed source applies a force to the free electrons, impelling them to travel to the positively-charged anode. The stream of electrons continues to flow as long as light shines on the cathode and the cell is connected to a source of D. C.

FIG. 3. Types of photocells.



The gas-filled cell works just like the vacuum cell, but the atoms of gas floating about in the tube quite frequently get smacked by electrons flying from cathode to anode. Because gas atoms also contain electrons, these collisions knock out electrons which join the stream of photoelectrons travelling to the anode. The current is thereby greatly increased.

But that is not all that happens. When an atom of gas loses one or more of its electrons, it becomes a positively-charged atom called an *ion*. The charge is necessarily positive because the loss of an electron means the loss of a negative charge from a neutral atom.

Interaction of Forces

Being positive, the gas ions migrate toward the negatively-charged cathode, for it's a rule that dissimilar charges attract one another. The bombardment of the photosensitive cathode by the gas ions shakes loose still greater numbers of electrons from the cathode. The moment these electrons get free, they join the crowd and hustle across the tube to the anode. So while the vacuum-type cell produces only electrons loosened from the cathode by the direct action of light, the gas-filled cell has not only

(Continued on page 38)

* Virginium is extremely rare. No one has yet obtained a sufficient quantity of its compounds to isolate the pure metal. Radium is radioactive, and hence unfit for use in photocells.

Excerpts from an address by a noted exponent of only the very best in projection quality, as originally given before the recent IA 42nd Biennial Convention in Cincinnati.

Past, Present – and Future (?)

By MERLE CHAMBERLIN

Director of Projection, Metro-Goldwyn-Mayer Studios

MY TOPIC is the so-called "new look" in motion pictures, Hollywood angle. My preparations for this talk consisted mainly of a concentrated session with my crystal ball. We are still in what I estimate as a state of flux, as far as some portions of the technical end of the industry are concerned.

For about 15 years . . . we sailed along . . . and then Cinerama opened up, which didn't affect too many of us but shot the gun that gave a terrific boost to the box-office. That boost is continuing. Not quite two years ago "Bwana Devil" in 3-D opened in Los Angeles. The Alliance was called upon to do a terrific job, technically speaking . . . and you have been told many times how well you responded.

"Experts" vs. Actual Achievement

I do not feel that Hollywood did too badly. Bear in mind the fact that a major industry, a multi-billion-dollar industry, did a retooling job in a very short time.

One thing that gave us trouble all over the country was the plague of "experts" we ran into. Everybody who was selling sun glasses in a drug store became an optical expert as far as motion pictures were concerned. Anybody who had anything to do with exhibition started making reels that wouldn't work . . . and most of these people obtained enough backing to print lurid ads in the trade papers which our exhibitor friends read and believed.

Most of our "executives" in the industry became "experts." . . . Not 10% of the people in this auditorium were consulted on these technical changes. We had the spectacle of people "inventing" all-purpose lenses and telling exhibitors that they wouldn't have to spend any more money.

General Trade Press Failed

Certain portions of the trade press let us down. They printed all those stories and . . . did not label them as press releases from the manufacturers' standpoint, making everyone's job in the IA that much tougher.

Here is one sentence from the July 22nd issue of *Daily Variety*, which is read by everyone in Hollywood, the only question being whether they read that first or the *Racing Form:*

> "Vox pop: many complaints about the focus on wide screen and 'Scope pix can be directly traced to sloppy projectionists and not to the film processes."

Many phone calls on that forced them to take it back the next day, but in a left-handed way. These are things we have to watch . . . and if any of us read anything wrong in the papers we should start calling them on it.

Double-Film 3-D is Dead

I think that double-film 3-D is dead—a gone pigeon. I do not believe that single-film 3-D is dead: there are now three or four single-film systems, double printing and projecting through a prism. Polaroid is working on a Vectograph system in which the polarization is printed on both sides of the celluloid, with filters eliminated. There is very little loss of light.

Wide screen: the various aspect ratios started out in quite a jumble—1.5/1, 1.66/1, 1.85/1 and 2/1—even prior to CinemaScope. There was no agreement on standards because the product on the shelf could not be adopted to a specific standard—an economic reason and a good one.

On Stage 16 at M-G-M Studios we have an experimental projection set-up, including everything we could think of with which to project a picture—*but* nothing that can't be purchased on the open market. We at M-G-M don't believe in technical adjuncts not readily available to exhibitors or projectionists in the field.

Yet, despite this view, we have 14 sets of apertures for each projection machine! so as to run anything and everything that has been made. We project a 61-foot picture on that stage at 125 amps.

Aspect Ratio Situation Jelling

Aspect ratios: excepting newsreels, the aspect ratio craze has seemingly settled down to 1.75/ or 1.85/1. I know that many of you are projecting pictures at 1.66/1, because that is the easiest, but everything being photographed in Hollywood today, in what they call "wide screen," is being composed for 1.75/ or 1.85/1, although still being printed for the 3/4 aperture for those theatres not yet equipped for anything else.

M-G-M is today shooting everything in 1.75/1, in addition to CinemaScope or whatever else they are using in the special deals. All of the studios are convinced that the old 3/4 picture is gone and that the wider aspect ratio is here to stay.

Present CinemaScope Projection

Now, varying aspect ratios call for various lenses. At M-G-M we have adopted what we call the "rubber" (variable focal length) lens, a take-off of the old stereopticon lenses which, attached to the regular lens, enables you to fill just about any screen size you desire. We have found this to be very successful.

CinemaScope has scored terrific gains since its introduction; but I

(Continued on page 36)

In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of new and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

THE production of motion pictures abroad has been for years a major preoccupation of IA studio workers and a serious problem for the International. One can hardly blame a producer who travels to Italy, to Austria, to Germany, or to England to shoot a feature-length production. On the other hand, one must not at his peril admit the technological know-how of Hollywood to be atrophied.

This is the extremely difficult situation confronting the IA on the occasion of the recent visit to this country (and to the recent IA Convention in Cincinnati) of Tom O'Brien, who directs the destinies of the organized craft in the British Isles. O'Brien's problem is no less acute than that of IA President Walsh, and they both have the primary objective of maintaining a high level of employment. Every foot of film shot on foreign shores represents an economic loss to our American technicians.

Nationalism as such may not be expressed in terms of visual-audio components, which know no boundaries. One may not look askance, however, at our Hollywood brethern seeking added employment. We have welcomed to these shores through many years the best technological brains that Europe has to offer, and it would be a pity if the artistic and technological talents of this industry were to be washed ashore on a tidal wave of misunderstanding.

Admittedly a very difficult problem to solve, it would seem that the suggestion by IA President Walsh that Labor be represented in all future international conferences relative to the production of motion pictures here and abroad represents a sound approach to this vexing question.

The fundamentals of this problem were explored by President Walsh at a recent press conference, a summary of which is appended.

If Labor were represented at all conferences on foreign-film agreements, even though it be in the role of an observer or advisor, it might serve to "overcome pitfalls" that are likely to present themselves in negotiations on foreign agreements.

Press reports indicated that Walsh was thinking along the following lines:

Eric A. Johnston, head of the MPAA, thought the idea of having Labor sit in at conferences on foreign pacts was a good one if it could be "worked out." However, "it has not been worked out yet."

In commenting on his talks with Tom O'Brien, general secretary of NATKE (National Association of Theatrical and Kinematograph Employes) on the British labor leader's complaints on the stand on U. S. production in England, Walsh reported that the two had "reached an understanding" looking to the solution of the problems involved by talking them over before they "become aggravated."

According to Walsh, the understanding provides that in any case where a British or American producer made a picture abroad for no other reason than that it was cheaper would be submitted to discussion.

Walsh said that the IA was "wondering" how it could work out a similar arrangement with unions, or, failing in that, with government agencies in other countries. The IA will shun such an arrangement with any foreign film unions that are Communist-dominated.

Walsh said he especially was opposed to the production abroad by Americans of Tv pictures that are used to promote the buying of American products. It was held inconsistent to ask Americans to purchase American products through the medium of pictures made abroad by U. S. video-film producers.

Walsh said that "runaway" production — that is, the production of pictures abroad merely to save money—would be resisted by the IA.

● M. D. O'Brien, director of sound and projection for Loew's Theatres who is now convalescing from an extended ilness, has asked this department to express his gratitude for the numerous messages of good cheer which he received from members of the craft throughout the country. These messages reached such an imposing total as to preclude the possibility of personal reply, thus Obie's desire to reach the very much larger audience provided by IP.

Here's hoping Obie's recuperative powers match the high standard of his projection work during the past years.

● Mention of Obie automatically brings to mind his life-long friend (and our constant critic) P. A. McGuire. Our thoughts of Mac were all on the sunshiny side until we received from him a flippant postcard from the cooled vales of New Hampshire (it was 96° that day in New York) telling us how very, very much he was enjoying the verdant New England dells.

You know, of course, that Mac added thereto the snide remark that "Better Projection Pays," a remark calculated to give us no surcease after just having typed an item anent the heat-on-film problem. That's Mac for you—always needling from afar, the while he coos pious platitudes within arm's reach.

● The annual Fall meeting of the New York State Association of Motion Picture Projectionists will be held at the American Legion Home in Ithaca, N. Y. on Monday, October 4 at 2 p.m. Business of the day will include the election of officers for the next two years.

Ithaca Local 377 will be host for the event, and extensive plans have been made to insure for all the delegates a pleasant time. The day will end with a banquet to which the delegates and guests are invited. The Ladies Auxiliary will have all the facilities of the Legion Home at their disposal during the day.

● The recent death of Harry Headland, business representative for Local 287, Rochester, Penn., broke up a

working partnership of almost 25 years. Back in August 1923, William H. Howe, present secretary of the Local, served his apprenticeship under the auspices of Headland, who was then in charge of the projection room at the old Majestic Theatre in Rochester. When the Oriental Theatre opened in 1931, both men were transferred there and worked together for almost 25 years.

• New two-year contracts, retroactive to September 1, 1953, have been concluded between Toronto Local 173 and the circuit and independent theatres in its jurisdiction. Under the terms of the new pact, the members will receive a 5% increase in wages, plus a raise of 25c per hour on overtime. Manpower—two men per shift—remains unchanged. Pay for midnight shows, to be held *only* between the hours of 12:05 a.m. and 3 a.m. is increased to $17.50. Provision is also made for a two-week vacation per man, with pay.

Representing Local 173 at the negotiations were A. L. (Pat) Travers, business representative, and executive board members J. Sturgess, L. Lodge, R. Higgins, A. Kerrin, D. Siegel, R. Wilson, L. Applebaum, and R. O'Connor.

• Both higher wages and shorter hours have been won by the sound service engineers employed by RCA and Altec, under the terms of a new contract recently concluded between the IA and the service companies.

The new agreement, which ended talks extending over a period of several months, is retroactive to August 22 last and calls for a 5% wage increase, bringing the basic weekly scale to $136.50. The basic weekly scale for soundmen covering more than one geographical area is raised to $159.43. The work week will be cut from 48 to 44 hours for a two-year period, after which it will be further reduced to 40 hours.

The contract also calls for the companies to furnish automobiles for the men when needed. However, in an emergency, not to exceed 30 days, a soundman will be paid 7c per mile for the use of his car.

Representing the IA at the negotiations were General Secretary-Treasurer Harland Holmden, International Vice-President Harry J. Abbott, and IA representative Joseph D. Basson. W. L. Jones, vice-president of RCA Service Co., in charge of the Technical Products Division, and H. M. Bessey, executive vice-president of Altec Service Corp., represented the employers.

SAN FRANCISCO LOCAL OBSERVES ITS 50TH ANNIVERSARY

Shown in this group of photos are members and guests of San Francisco Local 162 as they gathered to celebrate the Local's recent 50th anniversary. In photo at top left are officers of Local 162 group behind the anniversary cake: back row (left to right) are Herman J. Lehrbach, secretary-treasurer and Lawrence H. Weaverling, business representative; center row: Oscar Brostrom and James T. Luther Sr., executive board members, and William Van Ornum, vice-president; front row: Norman E. Moynahan, president; Paul G. Zorn and Antone Salemi, executive board members.

In the photo at bottom left are shown (standing) President Moynahan, who presented a 50-years membership pin to (standing at his left) William W. Lewis; (seated) Albert "Duke" Murray and Charles Zielinski, members of the Local.

Pictured at top right are business representative Weaverling and Helmar Erickson, life member of the Local; middle right: Robert Bemis, honorary member of the Local and manager of Walter G. Preddy Theatre Supply Co., and H. J. Lehrbach; bottom right: John Turturici, secretary of District Council 1 and business representative of Local 409, San Mateo, Calif., and W. Van Ornum, president of District Council 1 and vice-president of Local 162.

• The IA scored another advance in the Tv field recently *via* a ruling by the National Labor Relations Board which invalidated an election held by the employes of station KFSD-Tv of San Diago, Calif., which was won by the IA's arch Tv rival, NABET. Details in the case are supplied by the following excerpt from the report by the NLRB trial examiner:

"Recommends that company cease and desist from restricting its employes by rule or otherwise from engaging in union activities on company property during non-working time; from unlawfully assisting NABET by permitting only that labor organization to meet wtih its employes on company property; from making pre-election speeches to employes on company time and property so long as it maintains a rule prohibiting union access to company property on non-working time; or from in any other manner interfering with, restraining or coercing employes in the exercise of the right to self-organization, to form labor organizations, to join or resist IATSE or any other labor organization; and post compliance notices for 60 days.

"At the same time, the trial examiner recommends that the election held on April 13, 1954, be set aside, finding that company's conduct improperly interferred with the election."

Perspecta Sound Operational Data

By MARK STEPHENS

WHEN 3-D bowed in we were burdened with stereophonic sound recorded on a separate sound film. This system, requiring a synchronized magnetic reproducer, went out when CinemaScope came in. And now the new multi-directional Perspecta process threatens to overlay magnetic reproducers with cobwebs. Note we said *multi-directional*, not *stereophonic*.

True stereophonic sound involves a special recording technique as well as a reproducing system consisting of several amplifiers and stage speakers. The sound which is to be reproduced from two or more speaker units must be picked up by the same number of microphones in the studio, the electrical output of each being recorded *in a separate sound-track*.

Synthetic Stereo Sound

Much of the so-called "stereophonic" sound heard in theatres is a purely synthetic product. It is "faked" during the re-recording procedure to produce only the *effect* of natural stereophonic. The reproduced sound is directional, but it is not truly stereophonic.

The writer has heard both types of sound in CinemaScope pictures: true stereosound derived from three separate microphones on the movie set, and the merely directional type of sound concocted in the re-recording room. Be that as it may, the CinemaScope magnetic sound process is capable of true stereosound because it makes use of three (sometimes four) *independent* sound records.

Sound *quality* is something else again, and in this regard magnetic sound has been the target of numerous industry brickbats. Projectionists soon noted the noise-pickup and partial erasure of the magnetic tracks, the "fuzzy" sound resulting from magnetic-head wear, and the sharp clicks and pops produced by splices.

Theatregoers, no less than film critics, while sharply divided over the merits and faults of wide-screen projection, manifested an almost complete lack of enthusiasm for "stereophonic" sound.

Magnetic recording is expensive and troublesome, and the magnetic-striped prints cost almost twice as much as similar color prints carrying standard optical soundtracks. When Metro broke through the magnetic-sound barrier stranglehold by releasing its CinemaScopers in an optional standard-track version, it came as no surprise to anybody.

Perspecta "Directional" Sound

At this juncture there arrived on the scene a simplified directional-sound process which, armed with modest equipment requirements and conventional film and sound-track standards, is called Perspecta.

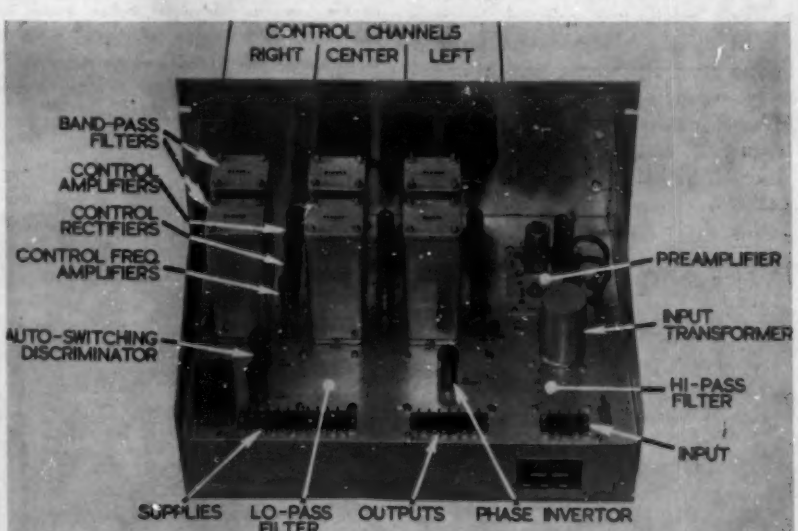
Invented by C. Robert Fine, engineered by Fairchild, and backed by M-G-M and Loew's, Perspecta is not true stereophonic sound but merely *directional* sound. It provides a means for channelling the sound from a single optical track to one or more of the three speaker units installed behind the screen. Perspecta sound is recorded in the usual single-channel manner, and it does not require a directional quality until the single soundtrack is "doctored" during re-recording.

In Perspecta sound three inaudible, or subsonic, low-frequency tones are mixed with the audible sound record during the final preparation of the soundtrack. The continuously varying signal-strength of these three tones, inaudible to the audience, act as controls to vary the volume of each of the three speakers—this for directional sound effects.

Function of the Integrator

The subsonic tones, called carriers, can be "heard" only by the Perspecta "integrator" which receives the total output of the soundhead photocells. The integrator unit is nothing more than an electronic switching device which directs the single-track sound output to the proper amplifiers, and thence to the proper speakers behind the screen.

The frequencies of the subsonic carrier tones used in Perspecta sound are 30, 35, and 40 cycles. These are



Components of the Perspecta integrator unit showing the hi-pass and the low-pass filters, the voltage-supply and the output terminals. This stripped-down view (in reverse) of the integrator shows all the important components of the unit, which should always be rack-mounted so as to provide for speedy and efficient servicing. NOTE: The extreme simplicity of this unit make unnecessary any extensive servicing, but what little service work is necessary may be safely entrusted to the national service companies' staffs which are intimately acquainted with the circuitry and operation of the assembly.

added to the track in the studio after the sound has been recorded. When the 30-cycle tone is superimposed on the sound record, the integrator will send the sound to the speaker behind the left-hand side of the screen. The 35-cycle tone activates the center channel; the 40-cycle tone the right-hand channel. If two or three carrier-tones are used *simultaneously*, sound will issue from *two* or *all three* of the stage speakers.

Perspecta sound has been hailed enthusiastically even by exhibitors who have had their fill of stereophonic sound and prefer regular single-channel sound emanating from the center of the screen. The reason for their enthusiasm is found in the fact that the three subsonic carrier-tones do not interfere with normal single-horn reproduction from the optical track. It is thus possible to use the same track for either regular or directional reproduction; and unless you want directional sound, there is nothing to buy.

Only One Integrator Required

Only one integrator is needed for Perspecta sound reproduction, regardless of the number of projectors. Also required are three amplifiers and three speaker units. Theatres equipped for CinemaScope already have the necessary amplifiers and speakers.

The Perspecta integrator may be obtained with or without a built-in preamplifier and impedance-matching transformers. If the projector soundheads are already equipped with photocell amplifiers, the "zero-gain" integrator may be used.

The output terminals of both soundheads (or preamplifiers) are connected to the input terminals of the integrator. Each of the three sets of integrator output terminals is connected to the proper main amplifier of the sound system.

The three main, or power, amplifiers are fitted with a "ganged" potentiometer to permit the projectionist to adjust the sound volume of the entire 3-channel system by means of a single volume control. A switch on the integrator enables a choice between directional and center-horn, non-directional reproduction.

The Perspecta sound integrator also embodies an automatic switch that directs sound output to the center speaker alone when all carriers read less than "20" on the three subsonic signal-strength meters on the front panel of the integrator. A steady carrier-reading of "50" on any one or more of the meters automatically returns the unit to directional-sound operation (see illustrations).

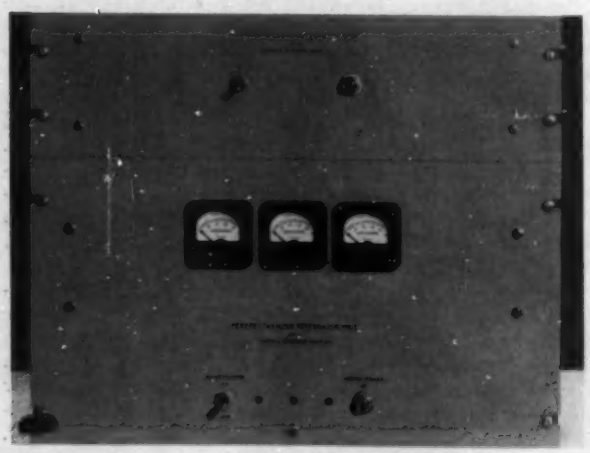
The simplicity of the automatic switch will be appreciated by all projectionists. It is not necessary to "ride" the integrator controls when non-directional films are spliced into a reel of Perspecta film: the integrator, activated by the strength of the carrier signals, takes over the switching chore.

The integrator is essentially an ingenious combination of band-pass filters. The main filter separates the three subsonic frequencies (below 60 cycles) from the audible sound frequencies (70 to 10,000 cycles).

The subsonic signals next encounter a set of three narrow-band filters which separate them (30, 35, and 40 cycles) and cause them to flow in separate circuits. Each of these filters is designed with a band-width of about 2 cycles to permit proper operation of the device, with projector speed variations of 4% above or below normal.

The A.C. from each of the three

(Continued on page 34)



Front panel view of the Perspecta integrator unit as it looks when installed in the projection room.

"Excellent Projection Equipment . . ."

• • • •

A Personal Message from Adolph Zukor

It has always been our policy that pictures should be capable of being played in any theater in the world. Therefore, we recommend standard sprocket-hole film and standard position, single, optical sound track. To improve the exhibition of pictures, we do feel that screens should be as high and as wide as the theater can install.

A year ago last May we released SHANE as the first of the wide-screen pictures from Paramount and have since perfected the VistaVision process to still further improve the definition and quality of picture. The first of the VistaVision pictures to go into release will be WHITE CHRISTMAS, to be released in October. Perspecta sound has been added to VistaVision prints and may be used, if desired, by any theater which has the proper equipment.

With regard to the shape of pictures on the screen, we are convinced that the most artistic shape is in a ratio of approximately 1.85:1, and we also find that this shape best fits the great majority of theatres. In the future we are confident that the best in the presentation of motion pictures will be obtained with VisaVision prints shown on a high, wide, seamless screen of this shape, and using excellent projection equipment.

ADOLPH ZUKOR

Chairman of the Board, Paramount Pictures Corp.

To the Editor of IP:

We have installed CinemaScope here, using a flat screen with a picture 26 feet wide. We have a 90-foot throw from the film aperture to screen and no stereophonic sound—just a single optical track. This CinemaScope installation has created a puzzling problem, as follows: When the picture hits the screen it appears to be all off balance. The vertical lines of walls, buildings, etc., seem to be curved in at the top and bottom, and background scenery appears to move in waves across the screen. It is a situation which I have never encountered before, and I've seen CinemaScope in other theatres, but never anything like the distortion that occurs in this theatre. The installing engineer, however, seems to think that everything is O. K.

The anamorphic lenses are set for 90 feet to meet the manufacturer's requirements and are attached to an old set of 6-inch lenses. These lenses are badly scratched and also balsam-blemished, but the focus seems sharp enough. The anamorphic lenses are made by Bausch and Lomb. Do you think the trouble is caused by the old objective lenses or by the anamorphics?

We have checked the keystone in the theatre and corrected it. We have also turned the anamorphics completely around so that the picture made a complete circle around the screen, but no matter what the position the vertical lines still had a curve in them. Maybe you could shed some light on this situation for us.

Many of us are shifting about, and I would not want to miss any issue of IP, as the information in these books sometimes proves many an argument.

ARNOLD HUMPHREY

Bathurst, New Brunswick, Canada

Long-Range Forecasting

WITHOUT having seen or tested Mr. Humphrey's CinemaScope setup, IP can only hazard an off-the-cuff opinion, i.e., that the distortion-trouble will be found in the opticatl system consisting of projection lens and anamorphic attachment.

One naturally thinks first of the screen when a case of distorted CinemaScope arises. The problem submitted by Mr. Humphrey has a number of unusual aspects, however. These rule out his flat 26-foot screen as the cause of the trouble.

A steep projection angle is ordinarily at fault when the vertical lines of walls, buildings, *etc.*, seem to slant in toward the top of the picture; but a downward tilt of the projectors cannot possibly result in a "slanting in" at the bottom. I assume that vertical lines in this case actually follow more or less smooth curves.

In any case, the position and flatness of the screen should be checked, and the keystone effect of an excessively steep projection angle partially mitigated by slanting the screen backward at the top by not more than 5 degrees. From what Mr. Humphrey says, we assume that the screen is perfectly stretched and lined-up.

What we ought to know is this: are the distortions described by Mr. Humphrey *visible from the projection room?*

As is commonly known, purely geometric distortions caused by projection angle and by screen wrinkles and an incorrect positioning of the screen are practically invisible to projectionists. Their viewing angle so nearly coincides with the optical axis of the projection set-up, that the picture looks fairly good from the projection room even when severe geometric distortions all but ruin the picture for persons seated in the auditorium.

Optical Mismatch Indicated

Let's suppose that the distortions mentioned—including the wavy appearance of the background detail—are clearly visible from the projection room. The trouble then boils down to the lenses.

There is evidently a peculiar optical mismatch between the old 6-inch lenses and the CinemaScope anamorphic attachments. But no matter which is at fault—projection lens or anamorphic attachment—the difficulty seems definitely to reside in the *combination* of the old lenses and the new anamorphic attachments.

Unless the anamorphics are of the wrong type, it would seem that the old 6-inch lenses are based on an optical design which is incompatible with the characteristics of the anamorphic attachments. Suspicion centers upon the lenses, rather than the anamorphics, because the anamorphics give the same unsatisfactory performance when turned around 180 degrees.

If a perceptible change takes place in the distortions when the distance between lens and anamorphic unit is radically changed, then it is all the more likely that the old projection lenses and the anamorphics cannot be optically reconciled. And, in such a case, the lenses and anamorphics should be *rigorously* investigated.

One cannot be absolutely sure, of course, that the anamorphics are of the right type. The manufacturer of these units should be supplied with as much data as possible — projection throw and angle; serial and model numbers of the anamorphics; make and serial number of the old projection lenses, their focal length and barrel diameter; your suspicions as to whether the projection lenses have ever been rebuilt or otherwise tampered with, and an exact description of the appearance of the CinemaScope pitcure from various viewing angles. It would be well, also, to give detailed information about the screen, including its size, type of surface, whether flat or curved, the make, and who installed it.

Lens Test Imperative

Even though we feel that the trouble is caused by a serious optical mismatch it might be advisable to get a *modern* 6-inch lens on loan in order to make a test. If the picture looks good with the loaned lens, then a pair of similar lenses should be purchased and installed at the earliest possible moment. If, however, the distortion persists, something is radically wrong with the anamorphics. That's the only way you can be absolutely certain as to which unit is causing the trouble.

The engineer responsible for the instalation of CinemaScope is responsible for the projection results, and he has no right to question your judgment. In no case should an installing engineer leave a theatre with projection conditions which are manifestly unsatisfactory.

IA OBITUARIES

HARRY E. HEADLAND, SR., business representative for Local 287, Rochester, Penna., died suddenly on August 25. Although under the doctor's care for the past several years, he continued his work as projectionist at the Oriental Theatre in Rochester until the day of his death. He took an active interest in union affairs since he was initiated into the Local in October, 1913. He served as recording-corresponding secretary for many years, and for the past eight years held the office of busines representative. For 34 years he was employed by the Rochester Amusement Co., 23 years of which he worked in the projection room of the Oriental Theatre. Prior to that he worked at the old Majestic Theatre. Surviving him are his wife, two daughters and two sons.

FRANK J. DILLON, 57, member of Local 521, Long Beach, Calif., succumbed to a heart attack recently. He began his career as projectionist in South Dakota in the early 1900's, moving to California in 1937. He became a member of Local 521 on March 6, 1947 and worked in a number of theatres in and around Downey, Calif. until about four years ago, when ill health forced him to retire. He is survived by his wife, a son and a daughter.

EVERETT L. COVINGTON, 63, member of Long Beach, Calif. Local 521, died suddenly several months ago. He worked at the Fox West Coast Theatre in Long Beach for about 25 years, and at the time of his death

The late Everett L. Covington, member of IA Local 521, Long Beach, Calif.

he was chief projectionist at the Crest Theatre. Everett Covington was initiated into Local 521 on April 20, 1922, only two months after the Local was chartered. He was a member of the executive board and served as a permanent member of the sick benefit committee. Surviving are his wife, a daughter, a son, two sisters, and two grandchildren. His son, Russell, is also a member of Local 521.

Ethyloid Into Larger Quarters

Vastly increased demand for Ethyloid film cement has forced its manufacturer, the Fisher Mfg. Co., to move into greatly expanded production space at 1185 Mt. Read Blvd., Rochester 6, N. Y. Peak production of Ethyloid in the new quarters will be attained within a brief period thus insuring a constant flow of product to all accounts.

Your patrons will notice the differencel Super Snaplites give you Sharper Pictures, More Illumination, Greater Contrast and Definition.

Clear Crisp Pictures with

SUPER SNAPLITE PROJECTION LENSES

For the Best in Projection use Super Snaplites . . . the only Projection Lenses to give you a true speed of f/1.9 in every focal length up to 7 inches.

Ask for Bulletin 212

"YOU GET MORE LIGHT WITH SUPER SNAPLITE"

KOLLMORGEN *Optical* CORPORATION

Plant:
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New York Office: 30 Church St., New York 7, N. Y.

PERSONAL NOTES

DR. FREDERICK E. TERMAN, dean of the school of engineering, Stanford University, has been elected to the board of directors of the Ampex Corp., Redwood City, Calif., manufacturer of magnetic sound reproduction equipment for theatres. He replaces Charles McSharry, who relinquished his directorship to become secretary of the board.

ELMER O. WILSCHKE has resigned as operating manager of Altec Service Corp. to become vice-president in charge of operations for Fine Sound, Inc., which operates one of the largest and most complete commercial recording studios in the East. Fine developed the Perspecta stereophonic sound method of recording now being used by a number of major Hollywood studios.

Wilschke, pioneer in the field of sound, joined ERPI (Electrical Research Products, Inc.) in 1928, following an association with Western Electric. During the early days of sound motion pictures he served in various capacities in this country and abroad. Upon formation of Altec Service Corp. in 1937, he became manager of the company's division office located in Philadelphia. From 1941 to 1946 he was Plants Manager of Altec Lansing Corp. in Los Angeles. He returned to Altec Service in 1946, and since 1948 he has been operating manager.

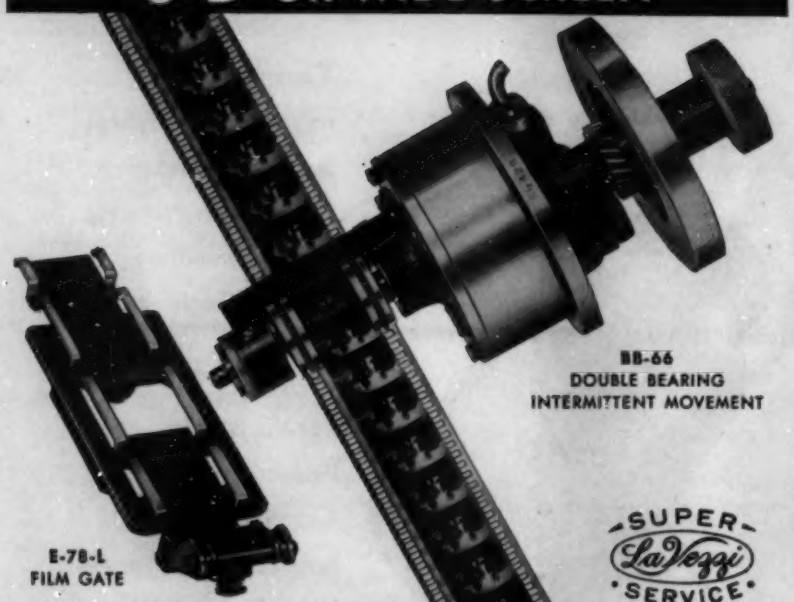
E. O. Wilschke, vice-persident in charge of operations for Fine Sound, Inc.

Wilschke has served on many technical committees in the industry and has made a number of worth while contributions to the sound equipment manufacturing and servicing field. Announcement of Wilschke's successor as Altec operating manager will be made shortly.

HENRY S. HERSCHMAN has been appointed advertising manager of the Radiant Mfg. Corp., Chicago, which produces a wide line of projection screens for both theatrical and amateur use. Radiant also distributes the recently introduced Gottschalk Super Panatar variable anamorphic lens. Mr. Herschman, who served as an aerial photography instructor during World War II, is a graduate of the University of Illinois.

Harry S. Herschman, advertising manager for Radiant Mfg. Corp. of Chicago

ROCK STEADY PROJECTION IS A MUST FOR 3-D OR WIDE SCREEN



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Fewer and Bigger Pictures Industry—Wide Trend

Hollywood may be making fewer pictures these days but those now being released are more likely to become box-office hits than at any other time in the history of the industry. This fact is established by estimates that at least 74 and possibly as many as 82 pictures will gross $2,000,000 or more in 1954. In 1949, for example, only 47 films earned that much.

This trend has been steadily developing despite anguished howls from owners of smaller neighborhood theatres who claim that this new approach to motion picture production—fewer but bigger pictures—is ruining them because there just aren't enough new films available to frequently change double-feature bills. It has been claimed that these neighborhood houses are patronized to a large extent by a hard core of habitual moviegoers who will attend frequently provided new pictures are being shown.

During this period of concentrating on better and fewer pictures, the producing companies have forgotten the old "B" picture which was the staple of these neighborhood houses. In general they are satisfied that the policy of concentrating on the big ones is going to pay off—at least for them and for the big-time exhibitor.

General Trend to Bigger, Better

20th Century-Fox, for instance, will have at least 14 and possibly more pictures in the $2,000,000 and over category this year; Metro will also have 14 and possibly as many as 17 pictures in this class, while Paramount expects to have about 13 pictures making over $2,000,000. Other studios have also produced a proportionate number of hits. It would appear that Hollywood executives have finally realized that better stories, better directed and produced, in combination with sensible use of the new technical processes, is the only way to compete with Tv. How much the small neighborhood house will be aided by this approach still is in doubt.

Test Your Electrical I.Q.

If you were required to pass an electrical licensing examination today, how well do you think you'd do? Starting this month, IP is presenting a group of questions asked at electrical licensing examinations given in New York City. Answer these questions yourself and then see how they compare with the answers given on page 32.

(1) What is a transformer and why is it used?

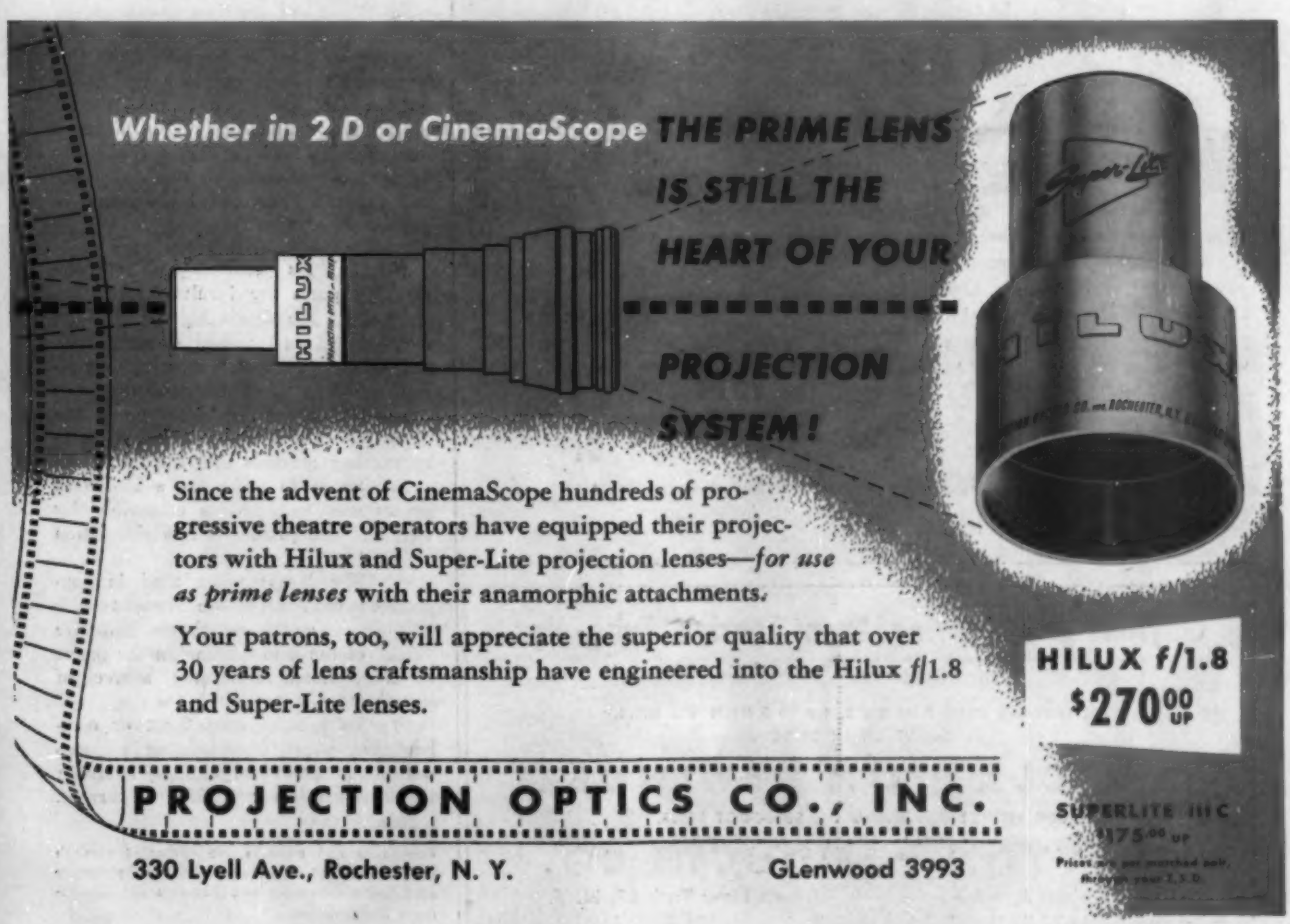
(2) Describe three ways in which A.C. current may be changed to D.C.

(3) How much current does a 110-volt, 500-watt lamp draw? What is the lamp's resistance?

(4) How would you recognize the series from the shunt-wound motor?

(5) What is a current transformer and what is it used for?

(6) (a) Why does the New York City Building Code require switchboards to be moisture-proof? (b) Why a space at the back of the board? (c) Why lamps, where protective resistance are necessary with automatic rheostats? (d) Why enclosed-type motor in dusty places?


Whether in 2 D or CinemaScope THE PRIME LENS IS STILL THE HEART OF YOUR PROJECTION SYSTEM!
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Your patrons, too, will appreciate the superior quality that over 30 years of lens craftsmanship have engineered into the Hilux f/1.8 and Super-Lite lenses.
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Electrical Exam Answers

The electrical licensing examination questions asked on page 31 are answered herin:

(1) A transformer is a device by which the voltage of an alternating current system may be changed. It consists of an iron core surrounded by coils of insulated copper wire. Usually both core and coils are immersed in oil which serves as an insulator and helps cool the transformer. The voltage is changed in exact proportion to the number of turns connected in series in each winding. For instance, if the high-voltage winding has 1,000 turns and is connected to a 2200-volt circuit, a low-voltage winding of 100 turns will give 220 volts. Transformers are usually wound for single-phase circuits and in groups of three, used for three-phase transformation, although three-phase transformers can be built and are often used. In either kind of transformer, the high-voltage and low-voltage windings are completely insulated from each other.

(2) A.C. current may be changed to D.C. first, by means of a motor-generator; second, by means of a rotary convertor; third by means of a rectifier. In a motor-generator set, the generator is driven by an A.C. motor, and is connected on the same shaft with a D.C. motor. A rotary convector changes A.C. to D.C. by means of one armature having one winding. A.C. is fed in one side through slip rings and D.C. is delivered on the other side through a commutator and brushes.

(3) The current taken by the lamp may be obtained if you remember that

$$I = \frac{\text{watts}}{\text{volts}} = 500/110 = 4.545$$

The lamp's resistance:

$$R = \frac{\text{voltage}}{\text{current}} = \frac{110}{4.545} \text{ or } 24.2 \text{ ohms}$$

(4) To recognize the difference between series or shunt-wound motor, the internal connections of the motors could easily be followed out. Series motors would have one side of line to series field, other side of line to armature, and a shunt motor differs only in respect to shunt lead connecting field and armature together.

(5) A current transformer is a transformer used to connect measuring instruments which measure current or its function and for relays which depend upon the current value for their operation to the power mains. The primary is connected to the mains and the secondary to the instruments or relays.

(6) (a) As practically all current-carrying parts are insulated, with exception of the insulating material on which they are mounted or supported, and as moisture has a deteriorating effect on brass and copper, and also causes the current to leak across between points of opposite polarity, thereby making grounds and short circuits.

(b) So as to make the switchboard connections and devices accessible for workmen and provide a free circulation of air.

(c) The lamps when used in conjunction with automatic rheostats are arranged so as to absorb the inductive "kick" of the field coils when the motor is disconnected from the source of supply.

(d) To prevent dust, light or combustible material from lodging in places where it is apt to be ignited by sparking from the brushes or leakage of current.

*Questions and answers are presented through the courtesy of Theo. Audel & Co., publisher of Audel's Questions and Answers for Electricians Examinations.

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Futter Anent Lens Situation

Citing production schedules which list many VistaVision and other wide-screen film releases during the first half of the forthcoming new season, Walter Futter, distributor of Vidoscope projection lenses, urges the exhibition industry not to overlook the necessity for good wide-angle, short-focus lenses necessary for the proper presentation of pictures which have *height* as well as *width*.

This comment by Futter, a veteran film producer and distributor, would seem particularly apropos at present when the bulk of discussion anent projection technique is centered upon anamorphic-type lenses. The Futter declaration may not properly be charged to self-interest, since he distributes *both* the cylindrical anamorphic and standard projection objective lenses.

"Flat Field" is Pronounced

Vidoscope lenses are made in Germany by the world-famous house of Schneider and are distributed through theatre supply dealers in America with standard U. S. mountings and fittings. They come in steps of 1/5-inch at a speed of F:1.9 in a complete range of focal lengths. Designated as the Super Kiptar series, they constitute an interesting departure from the time-honored Petzval-type lens which has served the projection field so long and efficiently.

The usual aplanatic, or Petzval-type lens gives superior performance only inside a field of view not exceeding 10 or 15 degrees. The Super Kiptar, a double anastigmat lens, would seem to give a clear field of approximately three times as great, namely, 30 to 45 degrees. This wide field of view which gives a "flat" field is ideally suitable for wide-screen projection. The chief difference between the Super Kiptar and other widely-used double-anastigmats is that the front internal couplet of the former does not have cemented components.

Futter has just opened new and larger headquarters at 625 Madison Ave., New York 22, N. Y.

Non-Toxic Film Cleaner

A non-toxic film-cleaning solution that can be sold at a price comparable to the cost of conventional solutions has been marketed by Neumade Products Corp., 330 West 42nd St., New York.

Called "Renovex," the new solution can be used without the usual precautions regarding ventilation or exhaust equipment, since the fumes are harmless and is non-inflammable, the Neumade company stated. An important secondary feature of the solution is that it is said to render film anti-static so that the film will actually repel dust particles or lint rather than attract them.

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NATIONAL
THEATRE SUPPLY
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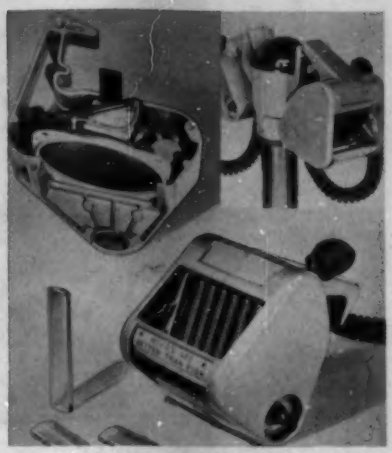
Simplex Drive-in Speaker Highly Shock-Resistant

The new Simplex drive-in speaker, now being marketed by National Theatre Supply, contains a number of design refinements to make it more resistant to rough treatment and easier for the theatre patron to use.

The unit includes a 4-inch Alnico-V aluminum voice coil speaker, spring-mounted into the two halves of the die-cast aluminum housing. This mounting method assures a floating suspension which reduces shock, minimizes magnet shifting and simplifies replacement.

The housing is finished in a durable silver hammertone enamel baked over a zinc chromate base, and has a two-step window bracket to aid in positioning. The handle is an oval-shaped plastic tube, providing space inside for a phorescent theatre name or slogan card which glows in the dark. The speaker is said to be weatherproof, and contains tamper-proof Phillips-Head screws throughout.



Three views of the new Simplex speaker for drive-in theatres.

Hi-Fi Show in New York

The largest assembly of high-fidelity enthusiasts ever to gather for a single event are expected to attend the 1954 Audio Fair, to be held for four days beginning October 14 at the Hotel New Yorker, New York City. A development of the last few years, the Fair is of interest to music lovers, hi-fi hobbyists and professional audio engineers. Interest in high-quality sound reproduction in the home has paralleled the development of new sound recording and reproduction processes in the motion picture theatre.

PERSPECTA SOUND OPERATIONAL DATA

(Continued from page 27)

"subsonic" band-pass filters is then rectified and smoothed out by capacitors and reactances. It is easy to see that these three D.C.'s vary in strength according to the amplitude of the 30-, 35-, and 40-cycle carrier tones in the soundtrack. Now, each D.C. is applied to the grid of a vacuum tube as a positive charge, or "bias." The positive bias on the grids of these three tubes will vary as does the strength of the carrier tones in the soundtrack vary.

The sound signal, or audible component, is conducted to the cathodes of the three "carrier-biased" vacuum tubes. Since a steady negative bias is also applied to these grids, the sound current can flow through the vacuum tubes *only when the positive "carrier bias" is strong enough to neutralize the constant negative bias.*

The intensity of the sound current

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for CinemaScope

flowing through any one of these three tubes from cathode to plate is therefore roughly proportional to the *amount* of carrier bias placed on the grid of that tube. And, as the amplitudes of the 30-, 35-, and 40-cycle tones are changing, the strength of the sound current flowing through the three tubes is always changing and varying.

Sound-to-Speaker Distribution

The sound-signal plate current from the tube controlled by the 30-cycle carrier is sent to the amplifier for the left-hand speaker. The plate current from the 35-cycle tube is sent to the center speaker, and that from the 40-cycle tube is sent to the right-hand speaker. In this way the sound output is divided between *any two or three* speakers, or directed to any *one* of them.

CinemaScope, employing *several* sound-tracks, can produce true stereophonic sound; but Perspecta, directing only *one* channel of sound to different speakers, cannot. If a soprano performs on one side of the screen while a guitarist accompanies her singing on the other side, it is clearly necessary to reproduce two separate sound signals simultaneously at different sides of the screen. Perspecta fails in this type of scene. The most it can do is compromise by channeling the *combined* sound to the center speaker — which is just the type of sound reproduction we started in with in 1928.

Quality Rating of Perspecta

In actual practice, however, Perspecta can seldom be distinguished from CinemaScope stereophonic sound. It has the advantage of a *permanent* optical sound record and standard film and soundhead specifications. Perspecta equipment is less expensive than CinemaScope, upkeep costs are very much lower, the prints cost no more than standard prints, the optical tracks can be reproduced monaurally without the need for special equipment, and the quality of the sound is consistently good.

The saving to the studios is even more impressive, as the cost of "doctoring" the sound-track with superimposed subsonic tones is stifling—but will the studios pass on these savings to the theatres?

The quality of modern optical sound is at least as good as that of

Finest Lenses Are Needed for New Projection Techniques...

THE ANSWER

Cinema Raptars

THE WORLD'S ONLY PERFECTLY MATCHED PROJECTION LENSES

Today with the new movie techniques—CinemaScope, Vista-Vision, Wide Screen—exhibitors must have the finest basic lenses in order to give theatre goers sharp, clear pictures from edge to edge of the screen. There are no finer projection lenses made than Wollensak Cinema Raptars. (For CinemaScope these lenses are used with anamorphic lenses.) Cinema Raptars use six and seven element construction. Only with such a design is it possible to deliver full speed, edge-to-edge sharpness, and highest resolution. In addition, Cinema Raptars are the world's only perfectly matched lenses—focal lengths matched to within .0025! Marked as matched (twin) lenses. Speed ranges are f/1.9 in focal lengths from 2" through 5" and f/2.0 to f/2.7 in focal lengths to 7" . . . priced from $180 each.

WRITE for new literature fully describing these new Projection Lenses.

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WHAT TO DO WITH NON-ANAMORPHIC RELEASES?

Wollensak

VARI-FOCUS

a supplementary lens for all screen sizes

With the new Vari-Focus lens exhibitors can show all the current screen releases without buying a complete new range of short focus lenses. The Vari-Focus permits you to make adjustments for screen width . . . change the focal length of your standard projection lens quickly and easily. (See table.) The Vari-Focus is a supplementary lens which will produce any wide screen aspect ratio (non-anamorphic) when used in conjunction with a 3" to 6" projection lens. The resolution and picture quality will match those of the finest projection lens. Price $235 each.

Standard Lens	Variable Focus From
3"	2¼" to 1⅜"
3½"	2⅜" to 2"
4"	3¼" to 2¼"
4½"	3½" to 2½"
5"	4" to 3"
5½"	4½" to 3½"
6"	5" to 3½"

WRITE for new literature fully describing this supplementary lens. Wollensak Optical Co., Rochester 21, N. Y.

MASTERPIECES of Optical Craftsmanship by WOLLENSAK

magnetic sound when the prints are new, and very much better after the latter have had considerable use. We foresee a slight amount of sound deterioration due to accidental intermodulation of the subsonic and audible signals, resulting in a low "gargle," but careful re-recording technique should eliminate this single possible source of danger to sound quality. At present, a maximum carrier amplitude of 16 decibels below a fully modulated soundtrack is employed.

Producer Confidence Evident

Perspecta has performed so satisfactorily in test runs in this country and in Loew's European theatres (where it is now being used for all M-G-M CinemaScope presentations), that it has now been adopted as the standard "stereophonic" process by Metro, Warners, Paramount (VistaVision)—in fact, by practically all producers except 20th-Fox. Perspecta has forced Fox to do something it swore it would never do—release its CinemaScopers in optional single-track versions.

Public Acceptance Held Assured

Public acceptance of Perspecta sound may be expected to follow the pattern of audience-reaction to CinemaScope sound. Directional sound, whether truly stereophonic or merely souped-up in the recording room, has never been a significant factor in movie attendance. With few exceptions, informed technicians feel that stereosound has been "tremendously overrated," that it "adds little, if anything, to the boxoffice value of a picture," and that 4th-channel reproduction of off-screen noises is "unnatural and distracting."

The chief value of Perspecta sound appears to be that it has restored the standard optical track to its rightful and well-deserved place as the only completely satisfactory medium of motion-picture sound accompaniment.

Congratulations to

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PAST, PRESENT - AND FUTURE?

(Continued from page 23)

don't believe that even 5% of the theatres are actually projecting CinemaScope at 2.55/ or 2.66/1, for which it was originally designed. Every theatre I have been in is using somewhere between 2.25/ and 2.4/1. Many in the industry feel that it would be eminently more desirable to get an anamorphic screen image that more closely fitted 2./1, in order to obtain better grain concentration and overall superior definition.

Paramount is, to my knowledge, the only studio that is shooting in the VistaVision process (first up is "White Christmas," due for late November release), and Par is the only studio *not* shooting in CinemaScope. At M-G-M, every foot of CinemaScope film is also shot in the 1.75/1

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wide screen ratio in order to get the widest general release possible.

Anent anamorphic lenses, it seems that we are already collecting another group of "inventors." Considered more or less standard are the cylindrical jobs of Bausch & Lomb, Bell & Howell and Vidoscope; while on the *variable* anamorphic side there are the Tushinsky, the Gottschalk, and the Hilux, the last a recent entry by Projection Optics Co.—quite a wide range of choice.

Type of Soundtrack Now Elective

CinemaScope releases, fortuitously, are now available in 4-track magnetic, 3-track magnetic, 1-track magnetic, 1-track optical, and in the Perspecta system. The magnetic tracks utilize the penthouse reproducer; while the optical track is normal procedure. There is a very good description of the Perspecta system in INTERNATIONAL PROJECTIONIST for July (2nd section).

Simply expressed, Perspecta consists of an amplifier system and sound power supply system that directs 30-, 35-, and 40-cycle tones, which is superimposed upon the regular sound track below the level of audibility, to the respective horn positions desired in back of the screen.

The screens available today are beautiful. I never accepted those screens with seams. Our craft had advanced far enough that we did not have to ask the public to look at pictures either through horizontal or vertical venetian blinds. Two or three manufacturers have large seamless, one-piece screens, while one has a 90-foot, seamless, one-piece screen.

Now as to film damage, a subject very close to my heart. Film damage with the new equipment was very heavy, but is now tapering off. If your equipment does not damage film, you are sitting pretty; but if it is damaging film, get after your employer fast and strenuously.

Inform your employer that the industry is definitely ready to again start charging for mutilated prints! We receive every day damaged prints that are definitely the result of substandard or worn-out equipment.

I have tested four different types of film-coolers which will be marketed. Three of them are basically room coolers, converted into projection coolers. The fourth is a very simple double cooler that not only cools the heat filters on your lamps but also has an auxiliary one which goes into the projector. This does a very good job of knocking the temperature down at the aperture.

New Developments on the Fire

Several new developments are on the fire, among them the Todd-AO process in which "Oklahoma" is now being shot at M-G-M and on location in Arizona. The regular Todd-AO projectors, not yet available, are supposed to project both 65- and 35-mm film. Presently the daily rushes are being projected on Ernemanns converted for 70-mm operation. The steadiness and amount of light leave much to be desired, but this problem seems not to be insurmountable.

Fox has started experimenting with lenticular color. Black-and-white film is projected through filters to obtain a colored screen image—still very much in the experimental stage, in my opinion, despite the various announcements that have gone out.

Another item is a 3-track optical stereophonic sound, now the subject of experiment with a CinemaScope picture and 35-mm tracks. In other words, instead of the track being 100 mils wide as at present, it will be 150 mils wide. The adaptor used to reproduce this triple optical track is a very simple prismatic affair that is slipped into the present soundhead. Nothing definite on results as yet.

In closing, I believe that it behooves all of us projectionists to keep on our toes on all fronts. Very good sources of informative material are readily available in the form of our *IA Bulletin* and INTERNATIONAL PROJECTIONIST. Every delegate here should return to his respective Local Union and do everything possible to spread the gospel of keeping abreast of all technical developments.

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AN EVALUATION OF OPTICAL SOUND

(Continued from page 22)

these but also electrons from bombarded gas atoms, and electrons from the ion-bombarded cathode.

As soon as a positive gas ion hits the cathode, it gets its electrons back from the external source of "anode voltage." When this happens, the ion turns back into a neutral atom and wanders back into the free space of the cell—only to get hit again by electrons, whence the process is repeated.

Millions of electrons, gas atoms, and ions interact all the time that light shines on the photosensitive cathode. A process as complicated as this cannot be started and stopped instantly. So while a vacuum-type photocell responds perfectly even to billions of variations of light per second, the response-lag of gas-filled photocells results in a loss of sensitivity of about 25% when the intensity of illumination changes 10,000 times per second (as when a 10,000-cycle test film is run).

Voltage, Hook-up Requisites

Vacuum phototubes require a D. C. voltage (anode potential) of 250 volts or more, but gas-filled cells would be injured by so high a voltage. In practice, a potential of about 90 volts is applied to the terminals of modern, gas-filled phototubes of the types used in soundheads. Excessive voltage ionizes the gas to such an extent that the cell glows and a strong current passes even without illumination of the photosensitive cathode. Violent bombardment of the cathode by the gas ions quickly ruins the cell.

In every case the positive terminal of the current supply must be connected to the anode wire of the cell, and the negative terminal to the photoemissive cathode. If the polarity be reversed, the cell will not work at all. Fig. 4 shows how photocells are hooked up to amplifiers.

The photosensitivity of the caesium used as the cathode of modern photocells is increased by mixing it with certain substances which react chemically with it. In the conventional red-sensitive cells used in most soundheads, the caesium is mixed with silver and oxygen atoms; in the blue-sensitive cells intended for use with dye soundtracks, the caesium is alloyed with anitomy.

Europeans still make their photocells with the light-sensitive cathode materials coated directly on the inner surface of the glass envelope. American manufacturers coat the photoelectric substances on a metal plate, usually semi-cylindrical in shape. The American method results in greater mechanical stability with less chance of severance of the connection to the cathode.

[TO BE CONCLUDED]

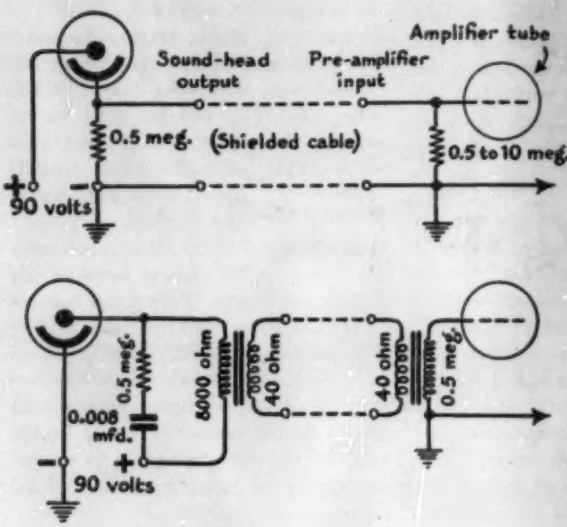

FIGURE 4

Top: resistance-coupled photocell circuit.

Bottom: transformer-coupled photocell circuit.

Triple-Header Trade Show

The continuing and widespread innovations being made in motion picture projection equipment have created much interest in the annual trade show of the Theatre Equipment & Supply Manufacturers Association scheduled to run from October 31 to November 4 at the Conrad Hilton Hotel in Chicago.

The TESMA show is held in conjunction with the annual conventions of the Theatre Owners of America and the Theatre Equipment Dealers Association. A large proportion of the exhibition space has already been reserved.

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